

# British Journal of Anæsthesia

Founded 1923 by the late Editor Dr. H M Cohen

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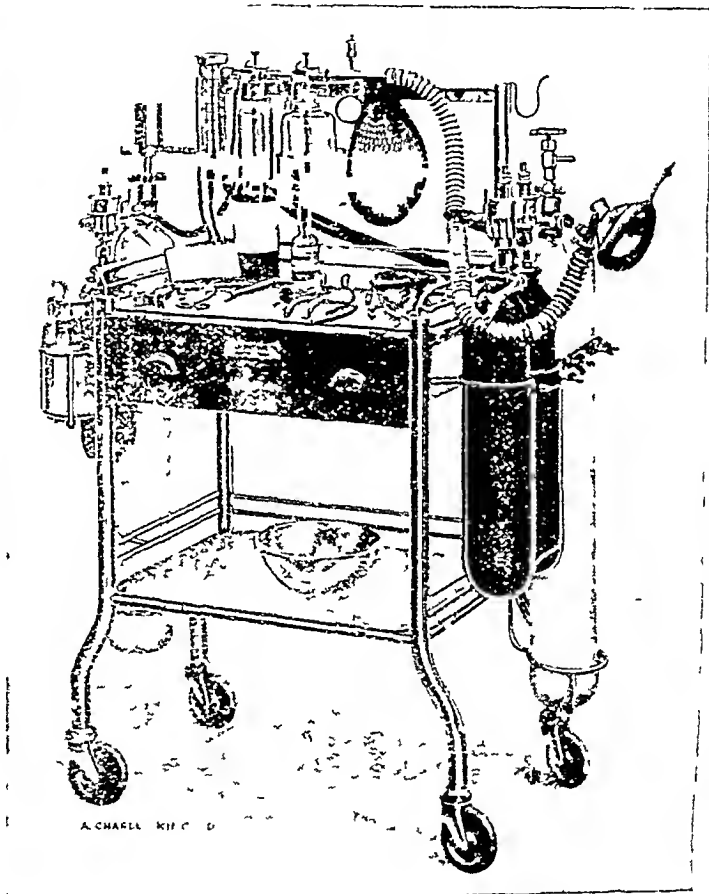


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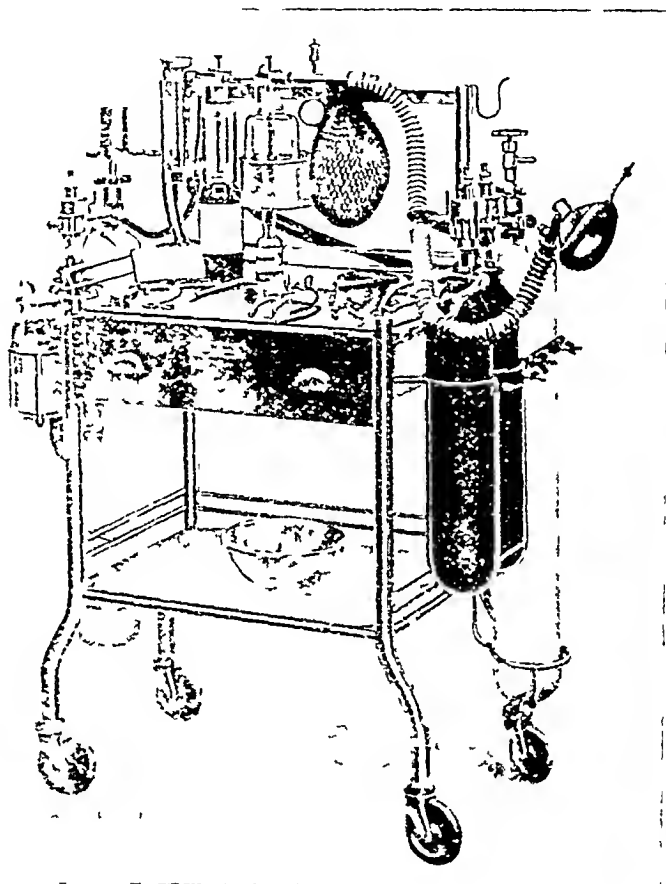
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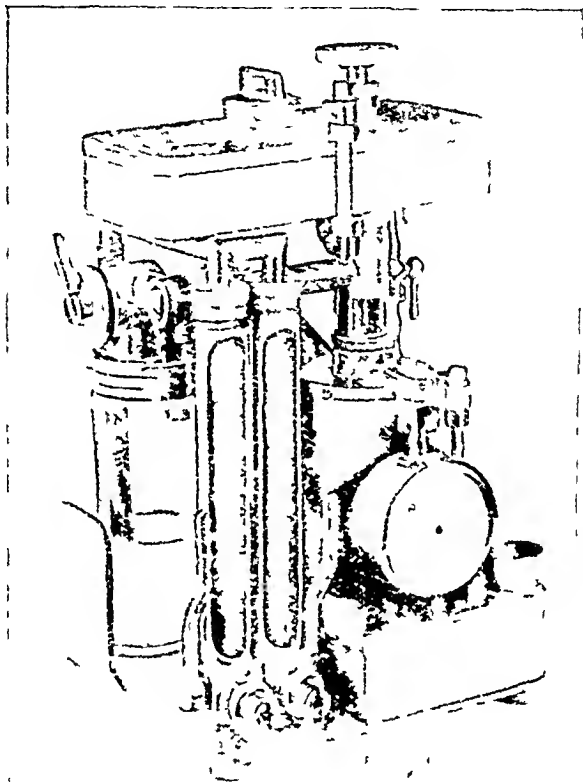


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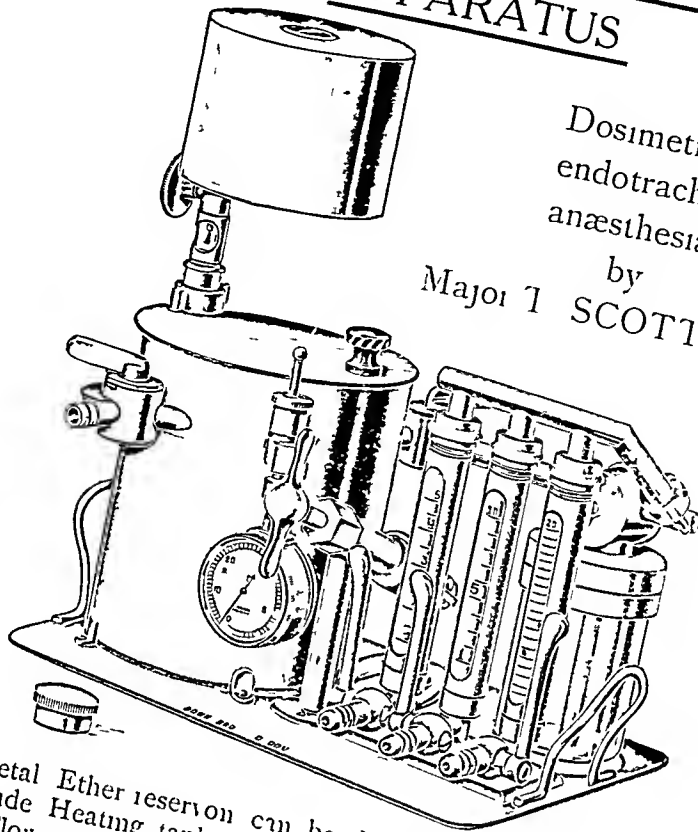
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# British Journal of Anæsthesia

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VOL XIII No 3

APRIL, 1936

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## EDITORIAL

THE report of the Departmental Committee on coroners, although chiefly containing recommendations which will affect and please legal persons who were dissatisfied with present arrangements, offers at least one paragraph which will be most welcome to medical men generally and to our readers in particular. This runs "we consider that coroners should be informed of all deaths under or in consequence of an anæsthetic, or during an operation, but that there should be an express statutory provision that, where an anæsthetic has been administered or an operation performed with reasonable care, a death which results should not be regarded, by reason simply of the fact that an anæsthetic has been administered or an operation performed, as a violent or an unnatural death. It should, however, be provided that the coroner, before deciding not to hold an inquest because he is satisfied that reasonable care was shown, should have regard to any views expressed by the relatives of the deceased." If this becomes law at least half of the grievance which anæsthetists have felt against present arrangements will be removed. This grievance was in part resentment against those inquests which were obviously unnecessary but which the coroner thought himself obliged to hold and which received unchecked publicity. This publicity often gave to minds of an indiscriminating public an impression almost of guilty conduct on the part of an anæsthetist or surgeon. Moreover, they were apt to put



unjustified fears into the imagination of susceptible persons who read them and who happened themselves to be about to undergo operation

By doing away with these inquests the publicity will be done away with too. This is a capital reform, and if, as we believe is true, it was facilitated by the evidence put before the Committee by representatives of the Association of Anæsthetists, then that Association may pride itself on once more having been of signal service to the body of its members and to anæsthetists in general. Moreover, we believe influence of the Association's evidence can be detected in another portion of the Committee's findings. This is the statement "We have been impressed by the need for scientific enquiries into the causes of deaths due to anæsthetics, but the arrangements to be made for investigating these deaths and for collating centrally the results of inquiries at local hospitals, do not come within our terms of reference. We believe, however, that the recommendations under this head will facilitate the conduct of scientific inquiries in these cases." The recommendations referred to are these "That steps should be taken administratively to ensure that the authorities of hospitals and nursing homes report to the coroner any deaths under anæsthetics or in the course of an operation, with such information about the circumstances of the case as the coroner may wish in this class of case. On receipt of this information the primary question to which the coroner should address himself is whether the circumstances are such that for his purposes he desires a post-mortem examination. Such an examination would be made at public expense, and normally the coroner might be expected to choose a pathologist outside the hospital in question for the examination. If the coroner does not require a post-mortem examination to be performed, he should inform the hospital authorities without delay in order that the hospital may make arrangements for an examination for scientific purposes if such is thought desirable." It is clear that the Committee thoroughly understood and appreciated the second chief grievance of anæsthetists, which was that for the purposes of increasing scientific knowledge or diminishing anæsthetic fatalities the present arrangements are futile. The Committee's enlightened views in this

respect are also manifest in their statement that post-mortem examinations ordered by coroners, save in exceptional cases, should be made by pathologists on a list to be kept by the Home Office under the advice of an expert Advisory Committee. If all the recommendations of Lord Wright's Committee are accepted we foresee in connexion with anæsthetics one possible source of error. This arises from the provision that coroners in future should be lawyers. When they are medically qualified, too, there should be no loophole, but we imagine the great majority will be without any special medical knowledge. For them it may be difficult to decide rightly when an inquiry should be held into an "anæsthetic" death, and we would have liked to see some provision for expert aid to the coroner in making his decision in these instances.

## ANÆSTHETICS IN THORACIC SURGERY WITH SPECIAL REFERENCE TO LOBECTOMY

By I. W. MAGILL, M.D.

(From a paper read before the Section of Anæsthetics, Royal Society of Medicine)

**D**URING the last six years thoracic surgery has continued to advance. Some new anæsthetics have come into prominence, and anæsthetic technique has been developed. In 1930 I was able to report only four anæsthetics<sup>1</sup> for lobectomy, in a period of eight years. To-day the number has increased to 128. This number includes 46 cases, anæsthetized by my colleague Dr. Machray, and represents the work of one surgical team only. The inclusion of the figures of other workers would provide even more striking evidence that lobectomy, which was formerly regarded as a rare operation even in a chest hospital, now appears on the operating list with considerable frequency. Aided and abetted by optimistic surgical reports, such as those of Tudor Edwards and Price Thomas<sup>2</sup> and by increasing confidence in anæsthetic technique, it is not unreasonable to forecast that lobectomy will appear with increasing frequency on the operation lists of general hospitals as well as of those devoted to surgery of the chest alone.

It has always been my conviction that the results of scientific research in any subject should be open for discussion notwithstanding the absence of finality in them, and as far as anæsthesia is concerned, the Section of Anæsthetics of the Royal Society of Medicine is the only body in this country which affords such an opportunity.

It is for this reason then, that I have undertaken to open the discussion on this subject, and I should like to take up the story at the point where we left it six years ago. If thoracic surgery is likely to become routine in the general hospital, it is well that anæsthetists, who may be called upon to share the responsibility in this branch of work, should benefit from the experience (mistakes included) of

those who have been engaged regularly in this special type of anæsthesia for some years

This preface also requires the addition of an apology. The presentation of a paper on a subject of this kind should be supported by case records, drawn up with meticulous care and accuracy. Blood-pressure charts are of particular value. I am sadly deficient in this respect, for like Portia "I had rather teach twenty what 'twere good to do, than be one of the twenty to follow mine own teaching." So to those of you who have the time and opportunity, I would say, keep a complete record of each anæsthetic given for a major thoracic operation. Such records will be valuable, not only to yourself but to posterity.

Anyhow the whole position will bear revision and some recapitulation, not only now, but again at no very distant date, with wider experience, more valuable conclusions should be forthcoming. For my own part, I am glad of this opportunity to correct some of my early impressions in the light of further experience.

The importance of respiration to life is a matter of common knowledge. During surgical anæsthesia, whatever the nature of the operation, the maintenance of free respiration is recognized as a first principle. It is a natural conclusion then, that the presence of disease in the organs involved in respiration, places many thoracic operations in a special category from the standpoint of anæsthesia. It is freely admitted, I think, that anæsthesia has already contributed much to the progress of thoracic surgery. Nevertheless, from the diversity of anæsthetic agents and of methods employed in various clinics, it is apparent that opinion is not unanimous as to which technique is best. This lack of unanimity is evidence in itself that all methods at present in use are as yet on trial.

In any case, before making a choice, certain factors which are common to many thoracic operations require careful consideration.

### *I Condition of the Patient*

Operation is usually decided upon when medical measures alone have failed to arrest the disease. Hence many of these patients are more or less chronic invalids.

They have been subject to toxæmia for a considerable time. Frequently they are exhausted by the ever-present necessity to cough up sputum and prevent its accumulation. Vital capacity is diminished, the lung area available for oxygen absorption being thus reduced. Dyspnœa occurs on slight exertion, and may be present even during rest. Clearly they cannot be regarded as good subjects for general anæsthesia and inhalation anæsthesia especially.

## 2 *The Requirements of the Operation*

To enable the surgeon to obtain access to the operation area, in most cases the patient is required to lie in the lateral position. A sandbag or air cushion is placed between the axilla and the table. This brings the affected side into prominence and also assists to some extent in maintaining freedom of movement of the lower ribs. Nevertheless the necessary position is to some extent a handicap to free respiratory excursion. This is especially true when the lung which is uppermost has been practically thrown out of function by pneumothorax and by forcible separation of the ribs. In this position, also, sputum from the affected side may be expelled or squeezed into a position in the trachea, providing conditions favourable for aspiration into the opposite lung. Aspiration is liable to occur in this way during collapse of cavities by thoracoplasty, or during manipulation of the affected lung in lobectomy. The possibility of such an occurrence must be prevented by suitable posture, by maintenance of an active cough reflex or by removal of secretions by endotracheal or endobronchial suction. I hope to show later that the transfer of secretion from one side to the other cannot be prevented simply by positive pressure, except in the presence of a bronchial fistula. However, there is one advantage in our favour. Muscular relaxation to the degree required for abdominal surgery is not essential. Hence deep anæsthesia is fortunately unnecessary.

## REQUIREMENTS OF THE ANÆSTHETIC

From the foregoing considerations it is apparent that the anæsthetic and the method of administration must fulfil certain requirements.

- 1 The agent or combination of agents should cause no irritation or damage immediate or remote to the lungs
- 2 Agents which are liable to cause post-operative acidosis should be avoided as far as possible
- 3 When general anæsthesia is selected, recovery should be rapid in order that sputum may be actively coughed up when the operation is over
- 4 The cough reflex should be active throughout unless provision is made for removal of secretions by suction while the operation is in progress
- 5 Positive pressure should be available to assist pulmonary ventilation when required

#### PREPARATION OF THE PATIENT

Thoracic operations are not usually emergencies, so that there is ample time for preparation. Every effort should be made to present the patient for operation in a condition of maximum fitness. Abundance of fluid and glucose during the preceding 24 hours does much to strengthen reserves. When profuse expectoration is a feature of the case, the patient is placed for a time, before coming to the theatre, in the position which enables him best to clear his lungs of sputum. This postural drainage is a definite help.

When the thorax is to be opened in the presence of a free pleura, I always feel happier when pneumothorax has been carried out a few days beforehand. I am certain that this is a more rational procedure than the sudden production of pneumothorax in the early stage of a severe operation.

#### PRELIMINARY MEDICATION

The administration of sedative drugs before these operations requires special consideration.

A patient who produces sputum in any considerable quantity requires the protection of active cough reflexes to enable him to avoid accumulation. Should the cough reflex be impaired during anæsthesia the onus of evacuating sputum falls upon the anæsthetist. As already pointed out, this can be accomplished by suction, but an active cough reflex is absolutely essential when this mechanical protection is withdrawn. Clearly then the action of any sedative used in thoracic surgery should be of short duration.

The choice of drugs depends to some extent on the nature of the subsequent anæsthesia. When local analgesia or spinal analgesia is to follow, the sedative should not be given in doses sufficient to abolish consciousness completely. Well-meant efforts in this direction frequently destroy all power of co-operation, with the result that the patient is both restless and uncontrollable. Omnopon and scopolamine, with a small dose of a suitable barbiturate, form a useful sedative combination.

On the other hand, when general anæsthesia is decided upon, the co-operation of the patient during the operation is most essential. Hence it is possible before general anæsthesia to extend to the patient the popular benefit of basal narcosis, again with the important proviso that only short-acting drugs be employed for the purpose. A practical method of carrying this into effect is to administer omnopon and scopolamine three-quarters of an hour before operation and obtain basal narcosis with a minimal dose of a short-acting barbiturate, such as evipan, given intravenously immediately before induction. Experience proves that basal narcosis produced with such a combination causes no material interference with the cough reflex, and detoxication of the evipan is complete when the operation is terminated.

For this purpose no doubt some of the newer barbiturates will prove equally useful.

### AVERTIN

As regards avertin, the advantages of this drug in other branches of surgery are well known. Generally speaking, however, the action of avertin is too long to be safe in the majority of thoracic operations, especially when the quantity of sputum is considerable. It may be used in children who detoxicate the drug rapidly, or in certain patients in whom the metabolic rate is high. In any case avertin requires careful administration, since the dose reckoned on body weight may not be required in full.

### METHODS OF ANÆSTHESIA AVAILABLE

These may be considered under the following heads

## I *Local Analgesia*

The *advantages* of local and regional analgesia are —

- 1 No irritation or damage to the lungs
- 2 No impairment of the cough reflex
- 3 No post-operative vomiting or interference with metabolism
- 4 Less bleeding than under general anæsthesia

The *disadvantages* are -

- 1 The length of time required for extensive injections
- 2 Possibility of delayed healing or necrosis in a widely injected area
- 3 Toxic effects of the drug
- 4 The performance of the operation on a conscious patient

## II *Spinal Analgesia*

Spinal analgesia may be conveniently discussed at this juncture

My interest in spinal analgesia in chest surgery was stimulated by a paper by Shields<sup>3</sup> of Toronto and by a personal communication from Dr F van Snell who had the opportunity of observing the work at Shenstone's clinic. Shields has published a further report on the subject in a recent issue of *Current Researches in Analgesia and Anæsthesia* <sup>4</sup>

I feel sure that many of us when using a high spinal in abdominal surgery have been surprised, if not actually alarmed, by the height of the anæsthesia obtained. We have been relieved also in the majority of these occasions to find that in spite of the height of the anæsthesia there has been no serious respiratory embarrassment.

I must confess that my first efforts at spinal analgesia in chest surgery were made with some trepidation. The prospect of paralysis of the abdominal and intercostal muscles in a patient whose respiration is already embarrassed by diminished vital capacity and by unilateral pneumonothorax is ominous in its import.

Nevertheless spinal analgesia appears to be a practical and safe procedure for lower thoracoplasty and lobectomy.



In conjunction with Dr Machray 23 spinals have been given for lobectomy and pneumonectomy, and although the numbers are not large they provide us with some first-hand information on the subject

A co-operative patient is a necessary asset, and, as already indicated in my remarks on preliminary medication, every effort should be made to preserve this asset intact. Naturally, however, a preliminary sedative is required. Our practice has been to give omnopon gr  $\frac{1}{3}$  and scopolamine gr  $\frac{1}{150}$  and intravenously just sufficient nembutal to produce quiescence without loss of consciousness. Two grains is about the average dose. The patient in this condition will obey commands. He will hold his breath or cough as required although frequently there is no memory of the operating theatre.

We have used percaine 1/1,500 to produce spinal analgesia, following the Howard Jones technique for upper abdominal surgery. While the patient is in the ventral position care is taken to lower both head and feet thus bringing the upper dorsal vertebrae into the highest position. With a hypobaric solution it appears logical to endeavour to obtain the necessary height of anæsthesia in this manner without increasing the dose.

After six minutes the patient is put into position for operation plus 30 degrees Trendelenburg. The operation then proceeds.

In three cases I attempted to gain height by using a 1 in 2,000 percaine solution in greater quantity. In two of these analgesia was imperfect. In a few cases while using the 1 in 1,500 solution analgesia was incomplete at the upper limit of incision and necessitated the addition of a local injection at this point.

The outstanding fact about spinal analgesia in the surgery of the chest is the manner in which it upsets previous conceptions about positive pressure in the presence of open pneumothorax. The patient is usually able to breathe quite well and rarely has it been necessary to administer oxygen on account of cyanosis. The cough reflex remains active throughout and sputum is voided with reasonable ease.

There is usually a fall in blood-pressure but in the majority of cases this has not been sufficient to cause

anxiety It is significant that the fall is less marked than in high abdominal operations under spinal analgesia It is interesting to note also that retching, which can be so distressing a feature in abdominal operations, is noticeably absent Post-operatively, the patient is placed in bed with the legs elevated The chest is gradually raised while the legs are kept in this position By such a compromise we provide the precautions necessary after any spinal anæsthetic and also those particular to a thoracic operation which calls for the assumption as early as possible of the semi-sitting position There have been some post-operative headaches, the incidence of which is of no greater import or frequency than with spinal analgesia in other branches of surgery

### III *General Anæsthesia*

When we consider general anæsthesia in the surgery of the chest our minds turn naturally to nitrous oxide and oxygen It is the most innocuous combination known, as far as chemical effects are concerned It is non-inflammable, an important factor when diathermy is employed, as it so often is, in these cases Where, formerly, I pursued with relentless vigour the ideal of pure nitrous oxide and oxygen in chest surgery on account of the absence of toxicity, my experience with cyclopropane has caused me to modify my opinion as to the wisdom of such a practice

I have already said that deep anæsthesia is usually unnecessary in thoracic surgery It is true, therefore, that with premedication much can be accomplished with nitrous oxide and oxygen without the help of a further adjuvant Pure nitrous oxide and oxygen anæsthesia implies at least some degree of suboxygenation, however, and it is surely better, if possible, to avoid this factor in patients whose oxygenation area is already diminished by disease

When diathermy is employed chloroform is the only adjuvant which can be used without involving the risk of explosion In the absence of diathermy vinyl ether is to be preferred Vinyl ether is without the disadvantages of chloroform, but is equally potent It is less pungent than ether The effects are quickly obtained and conveniently evanescent The discriminate use of an adjuvant in this

way would appear to be less harmful than the subjection of these patients to cyanosis in any degree

On the subject of pure nitrous oxide and oxygen in chest surgery there is some difference of opinion Mr Hewer<sup>5</sup> states in a recent publication that after trying out most of the possible alternatives pure nitrous oxide and oxygen is his choice anæsthetic in thoracic surgery—and this with quite moderate premedication On the other hand, Sellers<sup>6</sup> states, quite fairly I think, that the cyanosis, bleeding and laboured respiration in nitrous oxide-oxygen anæsthesia are not consistent with the idea of pulmonary rest in lung disease

Shields<sup>7</sup> objects to nitrous oxide and oxygen on the grounds that it gives rise to shock due to an inability to maintain adequate oxygenation and satisfactory anæsthesia at the same time It is significant that nitrous oxide-oxygen has been displaced by cyclopropane in some other chest hospitals in America

It is time, I think, that the position of nitrous oxide and oxygen was placed on an honest basis, consistent with surgical requirements in this country, not only in the surgery of the chest but in general surgery as well We know its value, we know also its limitations When one is called upon to meet the demand so often made nowadays, for gas and oxygen for any and every operation, whether it be the removal of a foreign body from the bronchus or a gastrectomy, one is tempted to suspect that this demand arises from previous experiences of nitrous oxide and oxygen, not altogether pure and unadulterated In making such a statement I am aware that I leave myself open to obvious conclusions as to my inefficiency Nevertheless, I am convinced that alternate bouts of cyanosis and oxygen inflation are unlikely to enhance the prospects of cure in patients suffering from pulmonary disease

*Evipan* has proved its advantages as a complete anæsthesia in thoracic surgery for short operations, as it has done in other branches of surgery I have found it to be particularly useful in the external drainage of lung abscesses When the needle is kept in position, successive small doses can be given as required without interfering with the cough reflex There is no doubt that other derivatives such as

pentothal will prove equally useful or even superior to evipan in selected cases

*Chloroform and oxygen* produce quiet anæsthesia without increased bleeding, and the mixture is non-inflammable. It does not appear justifiable, however, to use chloroform alone, if it can be avoided, in patients who are suffering from chronic suppurative disease

### THE HANDICAP OF DIATHERMY

With the exception of short operations which can be completed under evipan, diathermy practically curtails the choice of general anæsthetic to nitrous oxide and oxygen, and chloroform

*Ethylene* need not be considered since it has been largely replaced by cyclopropane

*Cyclopropane* has been adequately dealt with by Dr. Rowbotham<sup>3</sup> in his comprehensive paper read at the last meeting of the Section. On that occasion I recorded my own experience with the gas in thoracoplasty.<sup>9</sup> It is unnecessary, therefore, for me to enter into the details of administration. I need only repeat that cyclopropane is, in my opinion, a godsend in the surgery of the chest. I feel certain that the operator who is able to forgo the advantages of diathermy in favour of the atraumatic anæsthesia which cyclopropane provides, is amply repaid for his concession.

Cyclopropane is slightly more nauseating post-operatively than nitrous oxide and oxygen, but one finds on careful investigation that the latter combination is not so completely devoid of after-effects of this nature as it is popularly supposed to be.

### METHODS OF ADMINISTRATION

The barbiturates are the only agents which can be regarded as of practical value for intravenous use at the present time. They have already been mentioned in this category.

As regards the gases at present at our disposal, administration by means of a face piece and retention harness is all that is necessary in the majority of cases. In order to maintain the airtight fit which is so essential with closed circuit

methods a chin-strap proves a useful addition to Dr Clausen's harness

Should the airway become troublesome, a short Silk's tube passed through the nose is tolerated more readily under light anæsthesia than an airway of the Hewitt type. A few drops of any of the ephedrine-paraffin combinations will usually keep the nasal airway free without the necessity for any artificial device.

In certain cases, however, control of the larynx by intubation is essential to the safety of the patient under general anæsthesia.

Opinions are divided as to the necessity for intubation in thoracic surgery. Coryllos<sup>10</sup> apparently uses the intubation method for all thoracoplasties. He employs a metal tube which he introduces before induction of anæsthesia. While intubation facilitates suction which is necessary in certain cases it is not an essential factor in anæsthesia for the average thoracoplasty. At least that is our experience at the Brompton Hospital.

On the other hand, some authorities hold that intubation is unnecessary for any thoracic operation on the grounds that with deep anæsthesia spasm of the larynx does not occur. The wisdom of producing such a depth of anæsthesia in these patients without intubation is open to question, since deep anæsthesia is antagonistic to rapid recovery and return of the reflexes. It also leaves the patient without the natural protection of the cough reflex, or the mechanical protection of suction during the course of the operation.

It is unnecessary to enlarge upon the well-known advantages of intubation. During the progress of an extensive intrathoracic operation, the import of even brief laryngeal closure is obvious. Events move so rapidly in such circumstances that it is wiser to avoid their occurrence by the protection which intubation affords. In addition, intubation is necessary for the conduct of endotracheal and endobronchial suction during the course of certain operations, particularly in lobectomy and pneumonectomy for bronchiectasis.

It will be appreciated that the presence of abundant secretion in the respiratory tract may act adversely in two

ways (1) The secretions may be sufficient to block the trachea completely at times, or (2) they may spread to another lobe on the affected side, or to the opposite lung, with atelectasis or subsequent pneumonia as a result. For these reasons lobectomy and pneumonectomy for bronchiectasis present a problem which does not arise when the operation is undertaken for new growth.

The conditions pertaining to the former operations have given rise, therefore, to certain developments in intubation technique which are peculiar to thoracic surgery.

### ALTERNATIVE METHODS OF INTUBATION

*Method I* Endotracheal anæsthesia is established by means of a rubber tube passed through the mouth or nose in the usual manner. With the aid of a laryngoscope and stilette, a catheter is then passed into the trachea, or into the bronchus on the affected side and left *in situ*, suction being applied when necessary. Should it be desired to employ an inflatable cuff on the anæsthetic tube, a T-shaped metal connection closed at one end with a rubber cap makes practicable the passage of the catheter through the lumen of the tube when required.

*Method II* The second method originated with Waters, and entails the passing of a tube into the bronchus on the sound side combined with inflation of a rubber balloon at the bifurcation of the trachea. The insertion of a tube into the bronchus in this manner may be easy in theory, but is more difficult in practice. It is clear that such a tube must be accurately placed if it is to function effectively, and since I am unfamiliar with Water's own technique, with accuracy in view, I have devised for the purpose the instrument now shown (Fig. 1). The essential parts consist of a stiff inner canula (Fig. 1a) illuminated at the distal end from a battery in the handle. The canula is surmounted by a close spiral composed of fine metal tubing. The spiral is covered in turn by close-fitting thin rubber tied securely in position with silk in three places. The intervening piece of rubber between the two distal fastenings (Fig. 1b, c) forms the cuff which is inflated by means of a syringe. This method of using the spring coil itself as an air channel is, I believe, original. Actually this instrument was used at

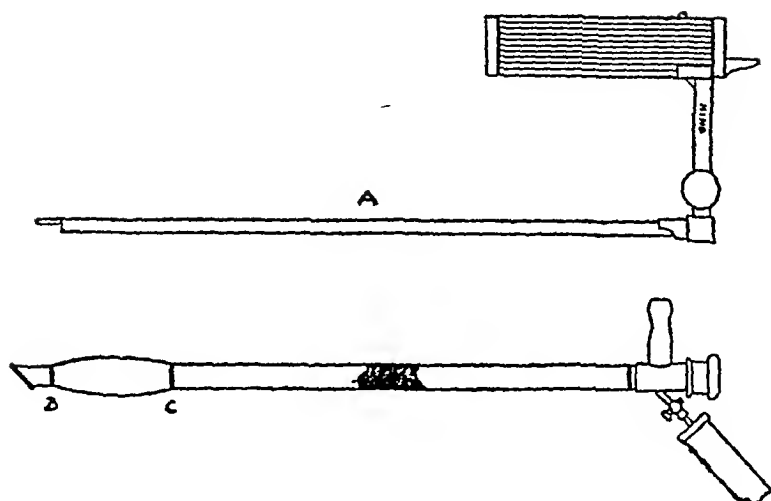


FIG 1

first with the cuff in the bronchus, the idea being that in this position the bulk of the cuff would not prevent suction on the opposite side. This proved impracticable for two reasons (1) There was an obvious risk of occluding the upper lobe bronchus when the instrument was used on the right side (2) The small balloon could easily be dislodged by surgical traction within the thorax or even by respiratory movements. This is explained by the fact that bronchi elongate and contract during respiration, whereas the tube is more or less rigid longitudinally.

In the trachea, on the other hand, a much larger balloon can be used, and with the greater purchase afforded thereby, there is less risk of the tube being dislodged from its correct position.

*Method III* entails the use of an endotracheal tube for anæsthesia combined with the insertion into the bronchus on the affected side of a suction catheter bearing a balloon to close off the main bronchus. At first I carried out this manœuvre with a laryngoscope and the directional aid of a stilette, but here again with a view to more accurate deposition of the catheter, I devised the combined tracheascope and anæsthetic tube now shown (Fig 2). To use this instrument, the larynx is cocaineized as for bronchoscopy. The tracheascope is then inserted, and the suction catheter passed through its lumen into the bronchus on the affected

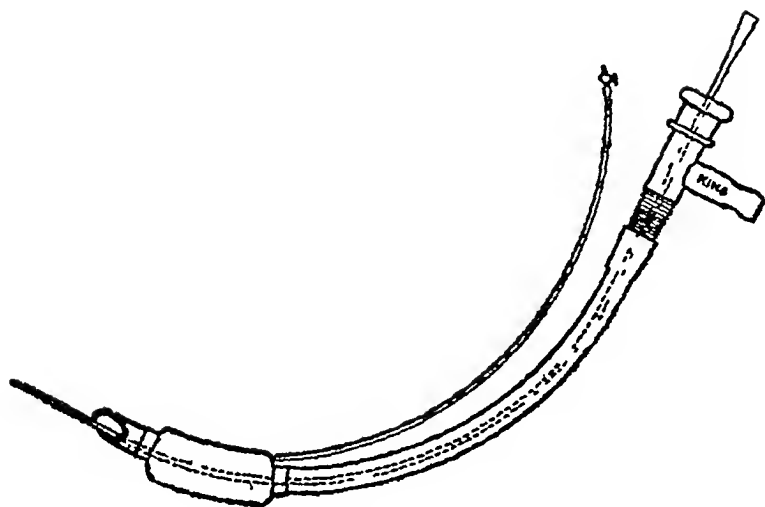


FIG 2

side before induction of anæsthesia. When the catheter is in position the carrier is withdrawn, leaving the anæsthetic tube (Fig 2b) in the trachea. In this way the protection of suction is in force before the dislodgment of secretions can occur, as it is liable to do, during the induction period. If desired an inflatable cuff can be mounted on the part which lies in the trachea.

I should like at this point to express my appreciation of the valuable help of Mr Tally, of Messrs Charles King Ltd, in carrying out the design of these instruments.

In the methods described, it is apparent that the first has been evolved with a view to removal of bronchial secretions while the operation is in progress. In the second method the object aimed at is to confine the secretions at any rate to the affected lung, without any attempt at removal during the operation. The third method may be described as a combination of the other two.

#### DISCUSSION OF METHODS OF INTUBATION

The effective application of any of these methods depends naturally on the dexterity of the anæsthetist and also to some extent on the age and development of the patient.

*Method I* is applicable to patients of any age, but the accurate insertion of tubes or catheters bearing inflatable cuffs may be a matter of some difficulty and should not be attempted in small children.



*Method II* is particularly suited to pneumonectomy. When used for lobectomy, since suction is not provided, there is a considerable risk of secretions being transferred to the sound lobe during manipulation of the lobe to be removed.

*Method III* appears to me to be a logical method of dealing with the problems of lobectomy. It provides for suction without any interference with anæsthesia. The affected lung is deflated and easy to handle. The small balloon prevents secretions from reaching the trachea in the intervals when suction is not applied. The flexibility of the rubber cap allows for movement of the catheter in accordance with the movements of the bronchus at the distal end.

The majority of lobectomies are undertaken for lower lobe lesions. With greater practice there appears to be no reason why the balloon should not be placed distally to the origin of the upper lobe bronchus in these cases, thereby protecting the upper lobe and ensuring its function during the operation.

#### CARBON DIOXIDE ABSORPTION.

Whether administration is by face piece or by intubation carbon dioxide absorption offers advantages which are likely to lead to its application whenever possible with gas or vapour anæsthesia.

Any device or agent which assists in preventing hyperpnœa is of material help to both surgeon and patient. Carbon dioxide absorption fulfils this object. It is economical—a factor of considerable importance with cyclopropane. It prevents the odour of the anæsthetic from disturbing the operator and his assistants. It lessens the risk of ignition of inflammable gases.

#### POSITIVE PRESSURE

Whatever difference of opinion there may be as to the necessity or otherwise, for intubation in certain thoracic operations, it is generally held that positive pressure anæsthesia is necessary when the thorax is open and the pleura free. Sellors<sup>11</sup> goes so far as to say that positive pressure is a *sine qua non* under these conditions.

The use of low positive pressure is a common practice with gaseous anæsthetics. It assists pulmonary ventilation

and absolves the patient from the extra work of overcoming the inertia of a column of gas

While positive pressure is obviously essential in the rare event of bilateral pneumothorax, and in emergencies, the necessity for it in every thoractomy is not so apparent

The respiration of a patient undergoing thoractomy under spinal analgesia is interesting in this connection. Here, not only is the thorax open, but some of the accessory muscles of respiration are paralysed, and yet the patient continues to breathe with remarkable absence of dyspnœa or cyanosis

Apart from the question of assisting ventilation, however, it appears to me that when sputum is abundant, pressure that is sufficient to inflate a diseased lung involves definite risks in its application. Constant positive pressure applied through a face piece or endotracheal tube at a level high enough to abolish respiratory movement or reduce it to a minimum, is an impediment to pulmonary circulation. It is necessary, therefore, to reduce the pressure at intervals. During these intervals, however short, secretions are liable to reach a point from which they may not only be aspirated, but actually forced into another lobe or into the opposite lung when the pressure is raised again.

Emergencies apart, the only instance in which positive pressure is of value is in the presence of a bronchial fistula. Here, however, the term is anomalous, for the fistula is in effect a safety valve which prevents the pressure from being raised appreciably. In such a case blood and secretions are diverted externally via the fistula rather by the increased volume of the gases than by their pressure.

Whether the thorax is open or not it is my own practice to use the lowest pressure consistent with smooth anæsthesia.

In lobectomy this pressure is frequently less than 1 mm of mercury as measured by a water manometer, rarely is it above 8 mm of mercury.

It appears to me illogical to apply positive pressure greater than this to diseased lung tissue if it can be avoided.

### CONCLUSIONS

The practice of using local analgesia in preference to general anæsthesia is clearly sound in thoracic surgery,

since the relatively greater disadvantages of the latter are avoided. On this basis it may be argued that local analgesia should be given first preference whenever possible.

Spinal analgesia has already been referred to. In the opinion of Shields, who weighs arguments carefully, spinal analgesia is in every respect superior to other methods in lower lobectomy and lower thoracoplasty. My own experience confirms this opinion.

The short-acting barbiturates are useful in short operations. It is not improbable that by means of continuous injection some of the new members of the group may prove their value in major procedures.

While the majority of patients in this country demand to be unconscious during operation, and since the apparatus employed for delivering gaseous anæsthetics gives controllability, assists pulmonary ventilation, and provides sufficient positive pressure should this be required in emergency, the choice of anæsthetic at present lies with nitrous oxide and oxygen, with vinyl ether or chloroform in the background as an adjuvant, or with cyclopropane. The respective positions of these agents in the surgery of the chest and the limitation of choice imposed by diathermy have been discussed.

I feel that this account of anæsthesia in major thoracic surgery and in lobectomy in particular, will prove disappointing to many of you. I make no excuse for this, for the experimental stage is not yet passed. It would be well to bear in mind, however, that the removal of the whole or part of a lung is still an operation of gravity. However great the improvement in anæsthesia in the future there will surely remain a limit to what the surgeon can accomplish in the chest with reasonable immediate safety and reasonable hope of cure.

#### DISCUSSION

Mr I. W. MAGILL (in reply) said that any tendency towards atelectasis occasioned by suction through a cuff-bearing catheter could be overcome by inflation after ligation of the stump, or by aspiration of air from the pleural cavity after closure of the chest wall. He thought that when immediate post-operative suction by bronchoscope re-

vealed the presence of blood or secretion on the opposite side, it was clear that the suction carried out by the anæsthetist had been inadequate. As regards spinal analgesia he had not exceeded 15 cc of 1 in 1,500 percaïne in any case. The combination of abundance of oxygen with CO<sub>2</sub> absorption made a considerable contribution to the quiet respiration noticeable with cyclopropane. CO<sub>2</sub> absorption could be used with advantage to diminish respiratory rate and excursion when nitrous oxide-oxygen was employed.

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## ANÆSTHETIC DEATHS IN MELBOURNE, 1929 - 1934.\*

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IN 1930 the present writer analysed 107 anæsthetic fatalities brought to inquest before the City Coroner of Melbourne in the years 1919 to 1929<sup>1</sup>. Since 1929 interest in anæsthesia has advanced considerably, and new drugs and methods have entered general use. It seemed desirable, therefore, to review the fatalities brought to inquest between July 1st, 1929, and June 30th, 1934. This review is embodied in the present paper, which may be regarded as a continuation of the work done in 1930.

### *Definition*

The 25 cases in the present series include patients who died (a) whilst actually under an anæsthetic, or (b) after returning to bed, but before awakening from the effects of the anæsthetic. Deaths occurring several hours after anæsthesia was terminated, and due apparently to grave injury or disease, have been excluded. Data are wanting for any inquiry into fatal post-operative respiratory sequelæ.

### *Distribution of Deaths*

Sixteen deaths occurred in public hospitals and six in private hospitals. In three other cases the anæsthetic agent was apparently taken with suicidal intent. The agent employed was a general anæsthetic in 22 cases and a local anæsthetic in three cases.

<sup>1</sup> Presented to the Australian Society of Anæsthetists, Melbourne, September 17th, 1935.

*Percentage Anæsthetic Mortality*

In 1919 to 1929 an average of 10·7 anæsthetic fatalities came to inquest yearly. In 1929 to 1934 the annual average was only 5·0 fatalities. This does not necessarily mean a decline in the anæsthetic mortality, because not every anæsthetic death comes to inquest. It is open to the coroner to give a simple order for burial in cases in which he feels that an inquest would serve no useful purpose. This discretionary power seems to be more often employed now than formerly.

The writer is indebted to the City Coroner of Melbourne for the following statement: "Where a death occurred whilst the patient was completely or partially under the influence of an anæsthetic, it has been my invariable practice to have a post-mortem examination made. I have not held an inquest when the findings of the pathologist showed (a) that an anæsthetic was used, (b) that according to the statements of the doctor(s) concerned the anæsthetics used were proper as to substance and quality and that the manner of their induction was in accordance with accepted practice, (c) that their use was only a minor factor in causing death, (d) that there were no circumstances of suspicion surrounding the death, (e) that the operation, if commenced, proceeded along traditional lines. I am unable to say if my predecessors took the same course. I have been moved by motives of economy in avoiding, in this connexion, inquests that offered no promise of serving a useful purpose."

This series of cases can give us, then, no clue as to any possible fall in the anæsthetic mortality since 1929. Its interest lies only in its being to some extent a selected series, in which the Coroner ordered an inquest because he wished to be more fully satisfied as to the soundness of the anæsthetic and surgical technique employed.

A clue to the present mortality in Melbourne is obtainable from the operation registers of our hospital. In 1919 to 1929, 13,400 operations were performed upon in-patients, with a death-rate "on the table" of 1·8 per 1,000. During 1929 to 1934 a total of 17,757 similar operations was recorded, with a death-rate "on the table" of 1·3 per 1,000. Details are as follow —

Anaesthetic	Cases	Fatalities
Ether (all techniques)	8,899	6
Chloroform	132	
Nitrous Oxide, Ethylene	2,255	13
Ethyl Chloride	22	
Spinal Anaesthesia	907	1
Regional and Local	2,393	4
Anaesthetic unstated	3,149	
	<hr/> 17,757	<hr/> 24 = 0.13%

In this series, the number of local anaesthetics is swelled by many cases requiring ophthalmic operations or endoscopy. The majority of the spinal anaesthetic administrations were for gynaecological operations. In the group marked "Anaesthetic Unstated," there was evidence that an anaesthetic had been employed and an operation performed, but no further details were available. Had any fatalities occurred in this group, it is reasonable to infer that the fact would have been recorded.

In the above series, as in the series published in 1930, most of the deaths occurred in cases where the patient was gravely ill or the operation was of great severity. This applies especially to the gaseous anaesthetics, which are selected for the worst "anaesthetic risks." In the series above, the mortality for the 2,255 gas cases was 6 per 1,000. This is actually less than the mortality in an earlier series of 1,937 gas cases reported from our hospital in 1931<sup>2</sup> and in which the mortality was 8.3 per 1,000.

It would seem, from the figures adduced by Clement,<sup>3</sup> and from our statistics, that the anaesthetic mortality in unselected cases is of the order of from 1 to 2 per 1,000. It would seem that, in our hospital, the mortality in in-patient surgery has fallen from 1.8 to 1.3 per 1,000 since 1929. Slight as this difference may seem to be, it represents (in the 17,757 cases above mentioned) eight fewer fatalities than would have occurred at the 1929 death-rate.

It is now proposed to analyse the data obtained in connexion with the 25 inquests upon cases of death during anaesthesia in Melbourne, 1929 to 1934.

#### *Deaths under Chloroform*

Three deaths occurred under this drug, all in the induc-

tion stage In two instances death occurred shortly after a change had been made to "open" ether anæsthesia, but before more than an ounce of ether had been given In two cases failure of circulation and respiration was apparently synchronous, in the third, respiratory failure preceded cardiac Details are given in Table I.

TABLE I

## Deaths Under Chloroform

No 1, age 43, female sex *Pre-operative state* Much blood loss, fast, weak pulse, "hæmic" bruit *Operation* Curettage for uterine hæmorrhage *Died* During induction\* *Failed first* Respiration *Heart* Some hypertrophy and dilatation, coronarie rather small *Lungs* Normal *Kidneys* Normal *Other organs* Uterus large with thickened prominent vessels *Comment* Chloroform injudicious

No 2, age 20, female sex *Pre-operative state* Apparently healthy *Operation* Diathermy of anal papillomata *Died* During induction *Failed first* Respiration and circulation *Heart* Relaxed, no atheroma, valves, coronaries normal *Lungs* Congested *Kidneys* Normal *Other organs* Normal *Comment* Heart probably not abnormal, chloroform not essential

No 3, age 22, female sex *Pre-operative State* Apparently healthy *Operation* Gynæcological laparotomy *Died* During induction\* *Failed first* Respiration and circulation *Heart* Relaxed, dilated, some aortic and mitral atheroma *Lungs* Congested *Kidneys* Congested *Other organs* General congestion, ovarian cyst present *Comment* Chloroform not essential, slight abnormality of heart

\* Had actually changed to "open" ether, although not above an ounce of ether had been given

*Pathological findings* One patient (No 1) had suffered from severe uterine hæmorrhage The other two patients presented slight aortic atheroma, but, as they were young adults and apparently free from clinical evidence of cardiac deficiency, one can scarcely attribute the fatal issue to this cause The pathological findings do not account for their deaths

*Choice of anæsthetic* In one patient (No 2) chloroform was employed to permit the use of the diathermy apparatus, a choice by no means obligatory in a metropolitan hospital in the year 1933 In case No 3 a less toxic drug might well have been employed, and in case No 1 (the patient with uterine hæmorrhage) should have been employed



*Comment* Chloroform was responsible for three deaths during 1929 to 1934. All occurred in the induction stage, again illustrating its dangers. Of the three patients, two presented no definite organic lesion to account for death. The use of chloroform was never obligatory and, in the case of the patient debilitated by hæmorrhage, was injudicious.

### *Death under Ethyl Chloride*

Only one death was recorded following administration of ethyl chloride. Taxis for reduction of strangulated inguinal hernia was to be performed upon a man aged 71 years. Anæsthesia was induced with ethyl chloride and, just as a change was being made to "open" ether, respiratory failure occurred.

Autopsy revealed aortic atheroma and atheromatous obstruction of the coronary arteries. The lungs were very congested and the airways full of gastric contents. The liver was friable, the kidneys subgranular, with adherent capsules. The brain was congested. Some coils of gut were hæmorrhagic, but the inguinal hernia actually contained no bowel. Death was apparently due to asphyxia by inhaled vomitus, the senile degeneration of the heart rendering it additionally sensitive to asphyxial changes. It is possible, however, that the degenerate heart may have succumbed to the toxic action of ethyl chloride, and that the gastric contents were forced into the air-passages during attempted artificial respiration.

### *Deaths under Ether "Sequences."*

Seven deaths were recorded in which anæsthesia had been induced with ethyl chloride or chloroform and maintained with ether. None occurred in the induction stage, and only one after the termination of the operation. In four cases initial failure of respiration was observed. Primary circulatory failure was present in one case, and synchronous arrest of circulation and respiration in another. In one case the evidence was insufficient for this point to be determined. Details of individual cases are given in Table II.

TABLE II

*Deaths Under Ether "Sequences"*

No 1, age 23, male sex *Pre-operative state* Healthy *Operation* Tonsillectomy *Induced with* Ethyl chloride *Died* 30 minutes after induction began *Failed first* Respiration *Heart* Muscle hypertrophied, valves normal, pericardium adherent *Lungs* Congested, oedematous, full of frothy fluid, smelling strongly of ether *Kidneys* Sl degenerative changes *Other organs* Normal *Comment* Pulmonary oedema, heart not normal, did ether enter lungs?

No 2, age 11, female sex *Pre-operative state* Healthy *Operation* Nasal antrostomy *Induced with* Ethyl chloride *Died* 10 minutes after operation began *Failed first* (?) *Heart* Dilated, else normal *Lungs* Congested, some blood-stained froth in airways *Kidneys* Normal *Other organs* Normal *Comment* No organic lesion to account for death

No 3, age 3, female sex *Pre-operative state* Pneumonia and empyæma previously, due to foreign body in lung, condition at time of anæsthesia fair *Operation* Bronchoscopy *Induced with* Ethyl chloride *Died* On insertion of bronchoscope *Failed first* Circulation *Heart* Base of aorta slightly atheromatous, else normal *Lungs* L lung adherent and riddled with abscesses, pus in airways, tack in L bronchus *Kidneys* Normal *Other organs* Normal *Comment* Death from reflex syncope?

No 4, age 19, male sex *Pre-operative state* Healthy *Operation* Septum and Tonsils *Induced with* Ethyl chloride † *Died* 10 minutes after operation ended, catheter was withdrawn *Failed first* Respiration *Heart* Normal, great veins congested *Lungs* Congested, blood in airways, sl laryngeal oedema *Kidneys* Large, firm, adherent capsules *Other organs* Normal *Comment* Asphyxia by inhaled blood, cough reflex had returned before catheter was removed

No 5, age 17, male sex *Pre-operative state* Healthy *Operation* Appendicectomy *Induced with* Ethyl chloride *Died* 65 minutes after operation began *Failed first* Respiration *Heart* R heart slightly dilated, else normal *Lungs* Very congested *Kidneys* Congested *Other organs* Congested *Comment* Osphyxial death explained by no organ lesion

No 6, age 19, male sex *Pre-operative state* Healthy, recent splenectomy for ruptured spleen *Operation* Fæcal impaction in anus *Induced with* Ethyl chloride ‡ *Died* On dilatation of anus *Failed first* Respiration and circulation *Heart* Heart slightly dilated, else normal *Lungs* Congested *Kidneys* Congested *Other organs* Congested *Comment* Death from reflex syncope?

· Endopharyngeal administration of ether

† Endotracheal administration of ether

‡ Had taken previous anæsthetic well

TABLE II (*continued*)  
*Deaths Under Ether "Sequences"*

No 7, age 19, male sex *Pre-operative state* Not robust, albuminuria *Operation* Appendicectomy *Induced with* Chloroform and ether, (1 3) *Died* On opening peritoneum *Failed first* Respiration *Heart* Much hypertrophy and dilatation, valves normal *Lungs* Congested *Kidneys* Very contracted, tough, granular, capsules adherent *Other organs* Congested *Comment* Cardio-renal disease

*Pathological findings* Pulmonary oedema was present in one case (No 1), together with abnormality of the heart. One patient (No 7) suffered from cardio-renal disease. Asphyxia from inhalation of blood occurred in one case (No 4). In two cases (Nos 3 and 6) death appears to have resulted from reflex syncope. Two patients (Nos 2 and 5) presented no organic lesion to account for death.

*Choice of anæsthetic* The choice of ether was reasonable in most instances, and induction with ethyl chloride or chloroform would not have materially enhanced the risk. In case No 3 ether must have been undesirable in view of the pulmonary condition, but was apparently used as a safer alternative to chloroform and as avoiding the great technical difficulty of bronchoscopy under gaseous anæsthetics. In case No 7 gas anæsthesia might have been a wiser choice.

*Comment* Pathological conditions likely to reduce tolerance to an anæsthetic were present in two patients, one suffering from cardio-renal disease and one from lung-abscess due to the presence of a foreign body. In the latter case death appears to have been due actually to reflex syncope caused by passing a bronchoscope through the larynx. One patient succumbed to reflex syncope caused by dilatation of the anus, an eventuality which could hardly have been prevented. One fatality, due to inhalation of blood, was definitely preventable. In two cases autopsy revealed no organic lesion to account for death. One fatality offers difficulty in classification. Death was apparently due to pulmonary oedema, which may have implied failure of a certainly abnormal heart. On the other hand, anæsthesia had been maintained by means of an unguarded Junker's apparatus standing in a warm water bath. It is thus possible that condensed fluid ether may have entered

the patient's lungs, which would account for the pulmonary oedema and the strong ethereal smell observed at autopsy

### *Deaths under "Open" Ether*

Five deaths occurred under "open" ether anæsthesia. One took place in the induction stage and one during the operation. The remaining three occurred after the operation had ended, but before the patients had recovered from the effects of the anæsthetic. Respiratory failure was observed in the patient dying in the induction stage. In two of the post-operative fatalities death was suffocative, the third showed synchronous failure of heart and respiration. The evidence in the case of death during operation was insufficient for the manner of death to be determined. Details of individual cases are given in Table III.

TABLE III

#### *Deaths Under "Open" Ether*

No 1, age 65, male sex. *Pre-operative state* Healthy apart from local lesion. *Operation* Abscess of alveolus and base of tongue. *Died* During induction. *Failed first* Respiration. *Heart* Relaxed, muscle friable, coronaries atheromatous. *Lungs* Congested, glottic œdema, pus in left bronchus. *Kidneys* Normal. *Other organs* Normal. *Comment* Syncope from entry of pus into lung, senile cardiac changes.

No 2, age 22, male sex. *Pre-operative state* Healthy. *Operation* Septum and tonsils. *Died* 50 minutes after anæsthesia began. *Failed first* (?) *Heart* Relaxed, dilated, slight aortic atheroma. *Lungs* Congested, some blood in airways. *Kidneys* Congested, firm, capsules slightly adherent. *Other organs* Normal. *Comment* No organic lesion to account for death.

No 3, age 25, male sex. *Pre-operative state* Healthy. *Operation* Frontal sinus. *Died* 1 hour after end of operation. *Heart* Relaxed, dilated, otherwise normal. *Lungs* Airways full of blood and mucus. *Kidneys* Normal. *Other organs* Cerebral congestion. *Comment* Asphyxia by inhaled blood, cough-reflex present before catheter removed.

No 4, age 32, male sex. *Pre-operative state* Healthy. *Operation* Septum. *Died* 1¼ hours after end of operation. *Failed first*

˘ Endopharyngeal administration of ether

† Endotracheal administration of ether

TABLE III (*continued*)*Deaths Under "Open" Ether*

Respiration *Heart* Slight aortic atheroma, else normal *Lungs*  
 Engorged, hæmorrhagic, containing inhaled blood *Kidneys*  
 Congested *Other organs* Congested *Comment* Asphyxia by  
 inhaled blood, had moved and phonated before death, no specific  
 reference to cough-reflex

No 5, age 20, female sex *Pre-operative state* Healthy  
*Operation* Appendicectomy† *Died* 9 hours after operation, without  
 regaining consciousness *Failed first* Respiration and circulation  
*Heart* Normal *Lungs* Congested *Kidneys* Normal *Other*  
*organs* Congested *Comment* Cardio-respiratory arrest during  
 induction, restored 20 minutes later, after cardiac massage, appendix  
 removed, death 9 hours later, without regaining consciousness, death  
 due to excess CO<sub>2</sub> or to overdose of ether

*Pathological findings.* Two patients (Nos 3 and 4) were asphyxiated by inhaled blood. One patient (No 1) died as a result of the entry of pus into the bronchial tree, his heart, too, was abnormal. The remaining two patients (Nos 2 and 5) presented no organic lesion to account for death.

*Choice of anæsthetic.* The choice of ether was reasonable in all cases, although a gaseous anæsthetic might have been preferred for the patient with the abscess of the tongue (No 1).

*Comment.* The patient dying as a result of entry of pus into the lungs suffered from an abscess of the jaw and base of tongue. During induction of anæsthesia the swelling of the jaw was observed to become suddenly less in size, respiration then became embarrassed and failed before the circulation. It is thus probable that death was due less to failure of a degenerate and intoxicated heart than to syncope due to rupture of the abscess into the lungs. Endotracheal anæsthesia, although theoretically indicated, would not have helped, the abscess ruptured before the patient was ready for laryngeal intubation. Two deaths occurred after rhinological operations under endotracheal anæsthesia, both from inhalation of blood. It is commonly regarded as safe to remove a laryngeal catheter after the patient's cough reflex has returned. In one case this had certainly done so, in the other case it probably had, al-

† Induction with aid of carbon dioxide

though the point is not explicitly stated. Most likely the patients' tongues had fallen back after the catheter was removed, a pool of blood therefore collected in the hypopharynx and was inhaled. It is probable that the insertion of a pharyngeal airway and more careful post-operative nursing would have prevented both these fatalities. In the fourth case a young and healthy woman was to undergo appendicectomy. Induction was with open ether, aided by carbon dioxide. Circulatory and respiratory failure occurred, either from overdose of ether induced by carbon dioxide hyperpnœa, or from fatigue of the respiratory centre caused by excessive administration of carbon dioxide. After twenty minutes, direct cardiac massage was performed and circulation restored; spontaneous respiration only returned twenty minutes later still. This interval between collapse and cardiac massage was probably long enough for irremediable anoxic changes to have occurred in the cerebral centres, which would explain the eventual death without recovery of consciousness. The decision of the surgeon to operate upon a patient so recently and so partially resuscitated was perhaps unwise, but probably did not much affect the issue. The fifth patient, a healthy young man, undergoing a rhinological operation, showed no organic lesion to account for death.

### *Deaths under Gaseous Anæsthetics*

Since gas anæsthesia is preferred in hospital practice for the worse "anæsthetic risks," the apparent mortality for this technique is high. Few of the fatalities come, however, to inquest, because the patients are often desperately ill and no useful purpose is to be served by further inquiry. The present series contains, therefore, but three deaths under gaseous anæsthetics. Nitrous oxide was employed in two instances and ethylene in one. No death occurred in the induction stage. Circulatory failure was observed in one case and respiratory failure in another, in the third, arrest of circulation and respiration were simultaneous. Details are given in Table IV.

## TABLE IV

*Deaths Under Gaseous Anæsthetics*

No 1, age 65, female sex *Operation and anæsthetic* Aneurysm R, subclavian artery, ( $N_2O$  and  $O_2$ ) *Pre-operative state* Cardiac decompensation, operation done at patient's express desire *Died* 45 minutes after anæsthesia began *Failed first* Circulation *Heart* Extensive atheroma aorta and coronaries, great arteries sclerosed *Lungs* Slightly engorged *Kidneys* Friable, subgranular, capsules adherent *Other organs* Normal, aneurysm, R subclavian artery *Comment* Cardio-renal degeneration, death from shock and heart failure

No 2, age 53, male sex *Operation and anæsthetic* Ileostomy for paralytic ileus, ( $N_2O$  and  $O_2$ ) *Pre-operative state* Gangrenous appendix removed 4 days before, intraperitoneal hæmorrhage, ileus, blood-stained vomitus, desperately ill *Died* As last sutures were inserted *Failed first* Circulation and respiration *Heart* Enlarged, relaxed, dilated, muscle friable, coronaries thickened *Lungs* Engorged *Kidneys* Smooth, firm, capsules adherent *Other organs* Free blood in peritoneum *Comment* Death from shock, apart from ileus, cardio-renal functions are open to doubt

No 3, age 25, female sex Exophthalmic goitre, ( $C_2H_4$  and  $O_2$ ) *Pre-operative state* Gravely ill, pulse 140 per minute *Died* Immediately after end of operation *Failed first* Respiration *Heart* Fair condition *Lungs* Congested, airways full of thick, frothy mucus *Kidneys* Congested *Other organs* Congested *Comment* Death from asphyxia by profuse mucous secretion embarrassing a thyrotoxic heart, change to endotracheal anæsthesia might have been wise

*Pathological findings* One patient (No 1) presented gross cardio-renal disease, with aneurysm of the subclavian artery The second patient (No 2) suffered from paralytic ileus following intraperitoneal hæmorrhage after removal of a gangrenous appendix The last patient (No 3) actually succumbed to asphyxia from secretion of mucus, acting upon a heart weakened by thyreotoxicosis

*Choice of anæsthetic* Assuming that regional or local anæsthesia was inapplicable, the choice of anæsthetic was the safest possible

*Comment* Two patients, suffering respectively from cardio-renal disease with aneurysm and from paralytic ileus (also with cardio-renal abnormality), were very bad subjects for anæsthesia Their deaths cannot be directly attributed to the anæsthetic or regarded as apparently preventable

The third patient was seriously ill with thyreotoxicosis, and was therefore a bad "anæsthetic risk". It is just possible, however, that intubation of the larynx, aspiration of the bronchial tree and adoption of endotracheal administration might have averted a fatal issue

### Deaths under Local and Spinal Anæsthesia

One fatality was recorded as having occurred under spinal, and two under local, anæsthesia. Individual details are given in Table V.

TABLE V

#### Deaths Under Local and Spinal Anæsthesia

No 1, age 34, male sex	Operation	Septum and tonsils
Pre-operative state	Healthy	Technique Local Anæsthetic
Cocaine, gr iv, as paste with adrenalin, for septum, novocain, 150 mg, with adrenalin, as local injection for tonsillar area		
Subsequent events	Sudden "collapse" at end of uneventful operation lasting 25 minutes	Heart Slow pericardial effusion, heart dilated, muscle tough and fibrous, some coronary atheroma, Lungs Intense congestion
Other organs	Congested	Comment Cocaine intoxication? heart not normal

No 2, age 23, male sex	Operation	Tonsils	Pre-operative state
Healthy, had successfully taken ether for antrostomy a week previously	Technique	Local	Anæsthetic Local application of 10 per cent cocaine paint, ethocaine, 125 mg, locally injected into tonsillar area
Subsequent events	On completion of injection, became comatose, violent clonic convulsions, hypethermia to 106°F, gradual circulatory failure in next 2¼ hours	Heart Dilated, otherwise normal	Lungs Congestion and cedema
Other organs	Congested	Comment	Cocaine intoxication? No organic lesion found to account for death

No 3, age 42, female sex	Operation	Laparotomy	Pre-operative state
Said to be an unsuitable "risk" for general anæsthesia, although reasons not given, spinal anæsthesia accordingly selected	Technique	Spinal	Anæsthetic Ethocaine, 500 mg, dissolved in patient's cerebro-spinal fluid and re-injected, patient then moved from bed to operating theatre
Subsequent events	Pulse and respiration failed simultaneously when abdomen was being opened	Heart Normal	Lungs Congested
Other organs	Malignancy of right ovary, with secondary abdominal metastases	Comment	Dose dangerously high, choice of spinal anæsthesia and transportation of anesthetized patient both open to criticism,



*Pathological findings* One patient (No 1) suffered from cardiac disease, and was presumably more than normally sensitive to the cardio-depressant action of local anæsthetics, especially of cocaine. The second patient (No 2) showed no organic lesion to account for death. The last patient (No 3) suffered from ovarian malignancy, but this was probably not the determining factor in the fatal issue.

*Manner of death* Sudden cessation of circulation and respiration was observed in two patients. The third, however, displayed the convulsions associated with an overwhelming cocaine intoxication.

*Choice of anæsthetic* With reservations in the case of cocaine, local anæsthetics are regarded as the safest possible choice. The patient dying under spinal anæsthesia received that anæsthetic because allegedly too ill for inhalational anæsthesia, a fallacious attitude towards spinal anæsthesia which has resulted in more than one calamity.

*Comment.* Both cocaine and the ethocaine group of drugs may produce intoxication. In cases 1 and 2, above mentioned, it is impossible to say definitely which of the two drugs was responsible for death. Due care was taken in each case that cocaine should not be swallowed by the patients, but, in view of the much greater toxicity of cocaine as compared to ethocaine, it is reasonable to assume that both were cases of cocaine poisoning. Case No 2 was particularly interesting, in view of the rapid onset of violent clonic convulsions and of respiratory embarrassment which threatened to be fatal, until it was relieved by endotracheal insufflation of oxygen. The convulsions then continued at intervals of about one minute for the next two hours, and could not be abolished by administration of ether. The temperature, because of the muscular clonus, rose to 106°F. Respiration was sustained by endotracheal oxygen-administration, and death was eventually due to cardiac failure. The spinal anæsthetic death lends itself to criticism on three grounds, viz (a) the dubious initial choice of spinal anæsthesia, (b) the dangerously large dose of ethocaine injected, i.e. 500 milligrammes, and (c) the undesirable practice of inducing spinal anæsthesia in bed and then transporting the patient to the operating theatre. On each and all of these

three counts the fatality may be regarded as having been preventable

### *Self-administered Anæsthetics*

Three cases occurred of suicide by administration of anæsthetics. Ether was employed in one case and chloroform in two.

*Case 1* An airman, aged 26 years, was addicted to inhalation of ether from a handkerchief. He was found dead in bed, profoundly cyanotic, with a bottle of ether by his side. Autopsy revealed intense congestion of all organs, especially of the lungs and air-passages. The stomach contents contained ether, indicating that the drug had been swallowed.

*Case 2* A former soldier, aged 32 years, suffered from traumatic epilepsy following a shell-wound of the head. He became addicted to inhalation of chloroform to mitigate headache. He was found dead in bed, intensely cyanotic, and grasping a bottle of chloroform. Autopsy disclosed a relaxed and flabby heart, congested lungs, an atrophic cavity in the brain at the site of the old wound, and the presence of swallowed chloroform in the gastric contents.

*Case 3* A woman, aged 40 years, had attempted suicide with chloroform three years previously. More recently she had been exposed to domestic and financial worries. She was found dead in bed, her head covered by bedclothes soaked in chloroform and an empty chloroform bottle lying near by. There is a reference to great discolouration of the face by intradermal hæmorrhages, but to no other autopsy findings.

### *Summary of Pathological Findings*

It is not easy, in reading depositions regarding anæsthetic deaths, to recreate the problems which faced the individual anæsthetists at the time. Further, post-mortem findings do not necessarily reveal the reasons for a particular fatality. The mere existence of a serious pathological lesion does not imply that the patient might not, under other conditions of anæsthesia or of surgery, have survived the operation. Further, pathological methods are not always helpful in

assessing possible disorders of function rather than of structure. Granting all these limitations, an inquiry such as the present may yet give a clue to the answer to two questions, which arise in every case of death during anæsthesia. The questions are simply whether disease-conditions existed in the particular patient which rendered an anæsthetic administration hazardous, and whether, in view of the above, the fatal issue was patently avoidable?

Excluding suicides, there were 22 fatalities in the series. The various pathological conditions present are set out in the table which follows. More than one pathological condition may have existed, but, in that event, emphasis is put on the condition most directly affecting the anæsthetic and its fatal issue.

TABLE VI

*Pathological Findings in 22 Cases of Anæsthetic Deaths*

Pathological condition	Cases
Abnormal heart	1
Cardio-renal disease	2
Hæmorrhage	1
Inhalation of blood	3
Inhalation of pus	1
Inhalation of vomitus	1
Ovarian malignancy	1
Overdose of ether and/or CO <sub>2</sub>	1
Paralytic ileus	1
Pulmonary oedema	1
Reflex Syncope	1
Reflex Syncope pulmonary disease	1
Thyreotoxicosis	1
No organic lesion	6
	—
	22
	—

*Preventability of Deaths*

In the following table an attempt is made to classify the above-mentioned 22 cases in terms of the possibility of having prevented a fatal issue.

<i>Frankly Preventable</i> (inhalation of blood, 3 over-dose of ether and/or CO <sub>2</sub> , 1 injudicious use of spinal anæsthesia, 1)	5
<i>Probably Preventable</i> (no organic lesion found to account for death)	6
<i>Possibly Preventable</i> (injudicious choice of chloroform, 1 possible entry of ether into lungs, 1 suffocation by mucus during thyreoidectomy, 1)	3
<i>Possibly Unavoidable</i> (inhalation of pus or vomitus during induction, 2 reflex syncope, 2 presence of cardio-renal disease, 2)	6
<i>Probably Unavoidable</i> (gravely ill patients, having cardiac disease and paralytic ileus, respectively)	2
	—
	22
	—

The high incidence of preventable deaths in the series is explained by the fact earlier mentioned, that really desperate "anæsthetic risks" are seldom made the subjects of public inquests in the event of death. It is in cases where the coroner requires further assurance that inquests are held.

### *Summary and Conclusions*

The present paper reviews 22 deaths under anæsthesia upon which inquests were held in Melbourne in the years 1929 to 1934. The possible conclusions to be drawn from the series are as follows:

(1) The small number of inquests in the period under review does not necessarily imply a reduction in anæsthetic mortality in Melbourne.

(2) If figures derived from our hospital may be applied to the metropolitan hospitals as a whole, there has been a slight but definite reduction of the anæsthetic death-rate during this period.

(3) The high incidence of preventable and probably preventable deaths in the series is explained by the conditions governing the decision to hold an inquest in a given instance.

(4) Whilst it is unreasonable to expect any man, even an anæsthetist, to employ faultless judgment and skill at all times and under all conditions, the fact still emerges that several lives were lost during 1929 and 1934 because of gross

errors in anæsthetic technique Undue emphasis need not be put upon such considerations as the avoidance of chloroform in a hæmorrhaging patient, or the timely intubation of the larynx in a case where the patient's respiration has become embarrassed by mucus-secretion It is sufficient to draw attention to such outstanding disasters as suffocation by inhaled blood in the period of recovery from the anæsthetic or embarrassment of the respiratory centre by overdose of carbon dioxide The following recommendations are therefore put forward, not because they possess any novelty, but because they are each connected with one or more fatalities in the present series

(a) Chloroform should be avoided unless directly indicated, and, above all, in toxic or exsanguinated patients The induction stage, be it once more iterated, is the stage to be most feared

(b) Anæsthetic apparatus in which air is blown through ether in a container requires an effectual guard-bottle

(c) Spinal anæsthesia is not the anæsthetic of choice for patients who are "bad anæsthetic risks" Patients should be transported to the operating theatre before, and not after, the intrathecal injection

(d) The danger of over-stimulation and fatigue of the respiratory centre from overdose of carbon dioxide should be remembered

(e) The means of intubating the larynx and insufflating air or oxygen should be at hand whenever an anæsthetic is administered In case of respiratory embarrassment there is no better form of artificial respiration

(f) In general an artificial airway should be inserted before the patient is returned from the operating theatre to bed Attendants should be trained to recognise and treat the causes of respiratory obstruction during the recovery period

### *Acknowledgment*

The writer desires to express his thanks to the City Coroner of Melbourne and to the Registrar-General of the State of Victoria for permission to use the official archives, and to their officers for much freely-given assistance

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## COMBINED EVIPAN-NOVOCAIN ANÆSTHESIA

(Continued)

By GEORGE BANKOFF, M D

**L**OCALLY the evipan-sodium does not damage the veins, they remain patent even after a repetition of the administration. No investigator has found signs of cumulative action and many have used it repeatedly without ill-effects. Rode, for instance, has injected evipan-sodium three times in two days for bi-lateral mastoiditis with high fever, Beck and Sebening have injected it nine times in succession and neither intolerance nor venous thrombosis have been observed. Other chemical investigations regarding the concentration of blood sugar, the function of the liver, the composition of urine, etc., have demonstrated practically no alterations produced by the evipan-sodium. The alkaline reserve is practically unchanged and the evipan is as innocuous as the local avertin anæsthetics.

The condition of the patients, their sex or age have no importance in regard to the evipan-sodium. Klages gives a wonderful account of his experience on 84 children aged from 2 months to 14 years. He did not observe any ill-effects in them, which give a particular importance to the evipan-sodium as an anæsthetic for children.

Even patients in a very grave state of hysteria or nervousness support the drug very well and the psychological effect is good.

### EVIPAN ANÆSTHESIA FOR MAJOR OPERATIONS

The rapid disintegration of the drug followed by the prompt recovery of the patient stamped the evipan as an ideal anæsthetic for short and minor operations, such as opening of abscesses, biopsies, reduction of fractures or dislocations, etc. Furthermore, tonsillectomy, resection of the ribs for empyema and various cystoscopic and bronchoscopic, etc., examinations have been successfully carried

out under evipan anæsthesia. In a case of a bilateral inguinal hernia Abel and Jarman found themselves obliged to inject for a second time during the operation. Rode has performed nine laparotomies for tubal pregnancy and placenta prævia. Weese has administered this anæsthesia in 10,000 cases for short operations without any fatal results, or alarm caused directly by the anæsthetic.

In the field of major surgery it seems that only A. Westerborn has employed the evipan-sodium as an anæsthetic. He began his experiments with this anæsthetic by using it for the beginning of the operation only, completing it with additional ether. Later on he carried out the major operations completely under evipan anæsthesia. This investigation found that patients react very differently to the drug, and therefore instead of establishing a scale of maximal doses on age, sex and body weight, etc., he prefers that the necessary dose to induce loss of consciousness should be the deciding factor in each individual case. An equal quantity of this dose is injected as soon as consciousness is lost, which should be sufficient to induce an anæsthesia lasting for about 20 minutes. The patient is kept continuously under complete anæsthesia during the whole period of the operation, by injecting periodically 1-2 c m of the solution whenever the patient shows signs of recovery. The amount of the solution is very variable, being greater in young patients. On the other hand, the debilitated require much less of the solution than those in robust health.

The results among 450 patients were excellent, not one death was recorded, a few of them were restless and excited during their recovery, some being so violent that they had to be forcibly kept still.

### PERSONAL TECHNIQUE

In order to avoid injecting large amounts of evipan-sodium solution, which although experimentally on animals did not show any particular ill-effect, and also taking into consideration that the evipan-sodium acts differently in many individuals, I have tried to modify the use of evipan in such a manner that it will be unnecessary to inject large



quantities, at the same time keeping the method reliable and certain

The largest dose used at the present time by Westerborn has never exceeded 27 cc of evipan-sodium solution. In some cases it was impossible to bring the patients into complete anæsthesia, for this reason it was necessary to give them additional ether or chloroform.

For these and other reasons my method intends to limit to a minimum the use of evipan, at the same time offering the best condition in which a surgical intervention should take place.

By combining the intravenous injection of 5-15 cc of evipan-sodium solution with regional infiltration or blocking the sensitive nerves of the operative field, I have been able to bring the patient to an ideal condition, which I have never witnessed during my experience with all other types of anæsthesia. The procedure employed is as follows. The patient is prepared as usual one hour before the operation, and given hypodermically a combined injection of morphia and scopolamine in the proportion of  $\frac{1}{4}$  grain to 100 grains. In the majority of cases this injection produces a condition of twilight sleep. The infiltration of the operative field is performed with one of the many procedures of local anæsthesia. In particular operations when blocking of the sensitive nerves is possible, preference should be given to this method. Soon after the local infiltration and blocking is complete, the patient is given intravenously 5-10 cc of evipan-sodium solution, thus bringing him to a most ideal condition of relaxation and anæsthesia. The intestines and all other abdominal organs are paralysed, and any surgical intervention may proceed easily. The duration of this anæsthesia is variable in different patients, but always varies between 1-2 hours, thus offering the possibility of performing any type of operation.

When dealing with a very nervous hysterical patient it is advisable to inject first the evipan-sodium solution intravenously, followed by the local infiltration or blocking of the operative field, in this way no psychological ill-effect can arise.

Without describing further all the advantages of this anæsthesia, I should like to mention that this type offers to

me the most ideal condition I have ever witnessed. It could be employed for every type of patient; age, sex or different pathological conditions do not alter in any way the success of the anæsthesia itself, no morbid condition is present which could be taken as contra-indication.

Practically all my operations are performed under this combined evipan-novocain anæsthesia, and I have never had any fatal results and sincerely advise systematical use of this method which dispenses with all disadvantages of the other methods of anæsthesia.

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## ABSTRACTS

*"Spinal anæsthesia, relief of pain by subarachnoid alcohol injections"* E L STERN *Clinical Med and Surg*, January 1936, p 7

The author, after a few clinical observations, the most important of which is that the desirable concentration for temporary anæsthesia is about 30 per cent of alcohol, gives with illustrations an account of a number of experimental injections into the subarachnoid space. His conclusions are summarized in brief as follows

(1) Alcohol introduced into the subarachnoid space produces an immediate blocking of nerve impulses in the dorsal roots

(2) Following the use of 95 per cent or absolute alcohol in small doses (under 16 minims) diminution or loss of touch, pain and temperature sensation may ensue and last several months. Severe intractable pain may be relieved for as long as twelve months after a single injection. With these small doses there is no motor paralysis, with larger doses one may cause paralysis or loss of muscle tendon and joint sense. There is definite evidence that sympathetic nerve-fibres may be affected by intra-spinal injection

(3) Varying degrees of meningeal inflammatory reaction result from endothelial injection of anæsthetic solutions

(4) After 24 hours alcohol causes the myelin in the dorsal root fibres to appear broken up in cats. No such changes have been described for other anæsthetics, and other animals

(5) Alcohol in small doses does not appear to affect primarily any part of the spinal cord itself

(6) Secondary degeneration of the ascending columns of the cord had been observed in cats 32 days after alcohol injection. Similar changes have been described following other spinal anæsthetics in dogs

(7) The effects within the subarachnoid space depend on the different chemical constitution of the solutions used and also on the actual concentration of the solution as it comes

into contact with nerve tissue Alcohol appears to have a more destructive action on nerve tissue than do the anæsthetic solutions of the cocaine series Extreme care is necessary in injecting alcohol intra-spinally

"*Avertin anæsthesia in childhood*" *Lancet*, January 25th, 1936, p 209

Accounts are quoted which show the wide use that is being made of avertin for operations on children in Sweden The great Children's Hospital, Kronprinsessan Lorisas Vardanstalt, used the drug 1,250 times without mishap and with excellent results up to October 1935 At first used only for exceptional cases, avertin provided such excellent results that it has now been adopted as the standard anæsthetic for children It is used for all circumcisions, operations for hernia, and for mastoid disease In many patients with empyema difficult to locate avertin is used for the exploratory punctures as well as for the operation itself Furthermore, it is stated that avertin solves the problem of the "child under school-age requiring unavoidably painful dental treatment" Tetanus, as in this country, has been treated with avertin

"*Effect on white blood-corpuscles and colloid-kinetic pressure of breathing oxygen-poor and CO<sub>2</sub> rich air*"  
*Tohoku Journ Experim Med*, November 1935, p 503

A number of dogs were used for the experiments The chief results recorded were after an hour of oxygen-poor air

(1) Blood CO<sub>2</sub> sank and severe acidosis was instituted The deficient oxygen saturation was increased and the oxygen capacity and haemoglobin content were both diminished

(2) The general albumen content of the blood increased. The globulin underwent an absolute as well as a relative increase Albumin, on the contrary, sank

(3) Colloid-osmotic pressure of the blood fell

(4) Sinking propensity of erythrocytes tended to be hastened

After twenty to thirty minutes of breathing of air rich in CO<sub>2</sub> there was found intense increase of blood CO<sub>2</sub>, reduction of oxygen saturation-deficiency, reduction of oxygen

capacity and haemoglobin content The colloid-kinetic pressure of the blood sank The sinking propensity of the erythrocytes was greatly diminished

*"Teaching anæsthesia service from the viewpoint of surgery"* A M WRIGHT Anæs and Analg, December 1935, p 246

It is not often that anæsthetists receive from a surgeon so full an acknowledgment as that to be found in Professor Wright's article, and for that reason we give ourselves the pleasure of quoting his concluding sentence After alluding to the fine work of M M Waters for the Department of Anæsthetics in the University of Wisconsin, Prof Wright said "The speciality of anæsthesia now holds the promise of becoming the broadest, the best organized, the most scientifically established among clinical fields The realization of his vision rests in the hands of those who develop and guide departments of anæsthesia in our educational institutions "

*"Cardiac failure during anæsthesia"* K BREMER S.A Med Journ, November 9th, 1935, p 755

"For total cardiac failure there is no time for any but the one method which has been known to restore the heart's action in many cases, and that is strong rhythmic pressure on the ventricles by means of the fingers of the right hand passed through a rapidly made incision in the upper abdomen " Later, the author writes "There are only three to six minutes available for re-establishing the circulation If there is longer delay the heart may still resume its beat, but the patient will probably remain comatose and die within five to forty-eight hours "

Many will disagree with these statements It is certainly true that life has been restored after a longer interval than six minutes of total cardiac failure, and it would be disastrous in practice if there were to be the early rush to abdominal incision recommended above At least stimulation of the right auricle by a needle thrust through the chest wall, a trifling procedure that has often stimulated the heart to activity, should be tried first

"Post-anæsthetic headache." *Archiv of Surg* January 1936, p 99

The author discusses the causation of headache after endothelial injection, adducing both experimental and clinical evidence in support of his views. More than one factor is involved. The most important he believes to be any irritating nature of the injected solution, and excessive absorption of cerebro-spinal fluid into the blood-stream. By using anæsthetic solutions carefully made up to be as non-irritating as possible, headache is reduced, he claims, almost to the point of disappearance in patients in the recumbent position. Stovaine is, he says, highly irritating. Any acid solution is irritating. A solution which is hypertonic or hypotonic is irritating, and the temperature is important, the injected solution should never be cold. Any solution lacking calcium is irritating. The solution recommended is procaine hydrochloride from 5 to 5.5 per cent. To this calcium chloride is added to make its strength 0.024 per cent. The solution is warmed to body temperature. To overcome excessive absorption of cerebro-spinal fluid four ounces of 5 per cent dextrose are injected directly after operation. This injection is made into a vein. This routine is said to abolish headache almost entirely, even in ambulant patients.

"Ether dosage after premedication." *Journal Pharmacol and Exper Therap* September 1935, lv, 1, 24-39

Conclusions curiously at variance with clinical experience were arrived at by experiments on dogs who were given either morphia, barbiturates, or magnesium sulphate before ether inhibition. In all instances it was found that there was no apparent synergism, the blood ether concentrations necessary for surgical anæsthesia and for respiratory arrest were not appreciably lowered. The margin of safety was not affected by these premedications except that it was reduced by magnesium sulphate.

\* \* \* \*

The French Society of Anæsthesia and Analgesia, 12 Rue de Seine, Paris, stimulated perhaps by the example of this *Journal*, is offering a prize of 2,000 francs for the best work on anæsthesia or analgesia, which should be sent in before March 31st, 1936. (*B M J*, January 25th, p 193)

## CORRESPONDENCE

---

### THE EMBLEY MEMORIAL LECTURE

*To the Editor the British Journal of Anæsthesia*

SIR,—You were good enough to publish the Embley memorial lecture which I delivered in Melbourne in September last. It has been published in the *Medical Journal of Australia*. I was gratified at the publication of the lecture, but it was accompanied by an editorial expression of opinion against which I have felt it necessary to protest. I would ask if that protest may appear in your *Journal* as it is quite possible that those readers who see the *Medical Journal of Australia* may read the denunciatory leading article there but not the lecture itself. The leading article closes with the following passage —

The results of the modern type of cerebral operation speak for themselves. If in the future surgeons are able to evolve newer methods of securing the necessary gentle handling of tissues, asepsis, hæmostasis, and so forth, together with speed, Dr Mennell's wish will be gratified. This does not at present seem possible. Dr Mennell comes from London as an anæsthetist of world-wide reputation. His views on anæsthetics and their administration will be listened to with respect. His utterances on cerebral surgery are to be deplored in a country where neuro-surgeons are trying to bring their art to the high level attained in other parts of the world. It is to be hoped that no serious attention will be paid to them.

In support of this contemptuous view the article says —

It can be dogmatically stated that the present so-called slow technique has achieved infinitely better results than were obtained by the older methods. To refuse to follow modern methods with a slavish attention to minute detail is to jeopardise the life of the patient. It has been computed that at present the death-rate for

complete removal of cerebral tumours in Australia, even with the use of modern methods, is somewhere in the region of 80 per cent Cushing has for certain types of tumour brought his mortality down to as low as 7 per cent What the death-rate with the old rapid methods was may be left to the imagination When the operation was performed rapidly, it was the exception rather than the rule for the patient to recover

Since writing the above I have seen the leading article in *The Lancet* of Feb 22nd entitled "The Gentle Surgeon," and it appears to me apposite to the remarks made in my Embley lecture and for which I am criticised Nobody can dispute what is said in that leading article about the surgery in the early part of this century, or that the advance in anæsthesia and the better understanding of shock have enabled surgeons to do without the extreme slashing speed formerly necessary But surely the pendulum has swung too far, more surgeons relying on the better anæsthesia for a too great deliberateness in their methods Gentleness and care combined with unflurried speed are the essentials of good surgery

In reply to the *Medical Journal of Australia* I have made the following protest which they will have received by now, and which I shall be much obliged if you will quote

I am, Sir, yours faithfully,

Z MENNELL

Harley Street, W

February 21st, 1936

COPY OF LETTER SENT TO THE EDITOR OF THE MEDICAL  
JOURNAL OF AUSTRALIA

Feb 4th 1936

Sir,—Holding the views you have so clearly and forcibly expressed in your leader of Dec 14th, I feel I must first thank you for your courtesy in giving a verbatim report of the Embley lecture I delivered in Melbourne in September, 1935



The slides, through an error, have been referred to incorrectly, but notwithstanding the well-known difficulty of reproducing coloured slides, they remain clear enough for anyone reading the paper to realise the mistake

Your leader is another matter, I wrote the lecture with extreme care, and apart from my personal views I am entitled without giving offence to give reasons why a change in anæsthesia has become necessary in certain cases. No one can be more alive than I am to the fact that there are two schools of thought in intracranial surgery, but I am convinced that speed and gentleness are compatible

You speak first of all of thoracic surgery. Surely it must be admitted that in this work speed is essential whether the operation is done under a local or general anæsthetic. The most recent lobectomy to which I gave an anæsthetic was done in twenty minutes under a very light chloroform anæsthesia, and the excellent result in this and in other cases in which I have been concerned makes me think that in the future the mortality of this very serious procedure may be lowered by a combination of speed and simple anæsthesia

I can well understand that when you admit an Australian operative mortality of 80 per cent for the removal of cerebral tumours some change is desirable. Such a mortality is far higher than anything I have met during the thirty-two years I have been giving anæsthesia for such cases. It is because I believe certain neurological surgeons have evolved "the necessary gentle handling of the tissues, asepsis, hæmostasis, and so forth together with speed" that "I cannot understand why it is necessary to be so slow" in making a bone flap, &c. Giving anæsthetics to such cases almost daily, and seeing them afterwards, makes it possible to form the opinion which I felt at liberty to express. I do so more readily as I have had the opportunity of seeing cerebral surgery in the new world and on the continent as well as in England. Are Dandy and Adson, whose skill is recognised throughout the world, slow operators? You will naturally reply to this more "vague and general statements." I have figures, of course, that could be made to prove anything, as they would include many desperate cases and a great variety of tumours

Here are the figures of four sets of cases

1 Pituitary tumours operated on by the intracranial route in one year Twenty-one consecutive cases in 1928 without any untoward symptoms or death Shortest time forty minutes, longest seventy-five minutes Neither the late Sir Percy Sargent, who was the surgeon, nor I could claim this a constant figure, but the facts are as stated Anæsthesia intratracheal ether with pressure

2 Gliomata unselected and unclassified The late Sir Percy Sargent's records, analysed by Mr Harvey Jackson, who has given me the following data

Two hundred and sixty successful cerebral gliomata—mortality 12.7 per cent within forty-eight hours

This is case mortality and not operative mortality, which would be considerably lower

3 Hedonal anæsthesia A hundred and twelve cerebral tumours removed reported in the *Transactions* of the Royal Society of Medicine, Section of Anæsthetics, 1922 No death from anæsthetics within twenty-four hours

4 To illustrate work with which I am concerned in London (if one may venture to cite English experiences in Sydney) I quote one of my last cases (surgeon, Mr Julian Taylor)

H L 38 Operation Jan 31st, 1936, for left parietal endothelioma Anæsthetic started 11.20 a.m. Large bone flap extending across midline Tumour, weighing 82 grammes, removed Part of the bone flap taken out which was invaded by the tumour, and then fixed in position Wound closed and patient in bed 1 p.m. Condition good Anæsthetic Atropine, intratracheal  $N_2O$  and  $O_2$ , ether

Feb 2nd Patient comfortable Sitting up in bed eating food

To-day, Feb 4th Pulse 76, temperature 97.6° Patient sitting up apparently without abnormal symptoms

The use of local anæsthesia and basal narcotics may be the most usual practice in Australia, it is not here A small quantity of ether added to continuous stream of gas-and-oxygen is believed to be the best after an extensive trial of other methods I hasten to add pulmonary complications do not occur

My first expression on reading your leader was surprise, but then it occurred to me how my old friend, Embley, would have risen to the occasion, and I only wish I had his facile pen and power of expression at my command

I am, Sir, yours faithfully,

Z MENNELL

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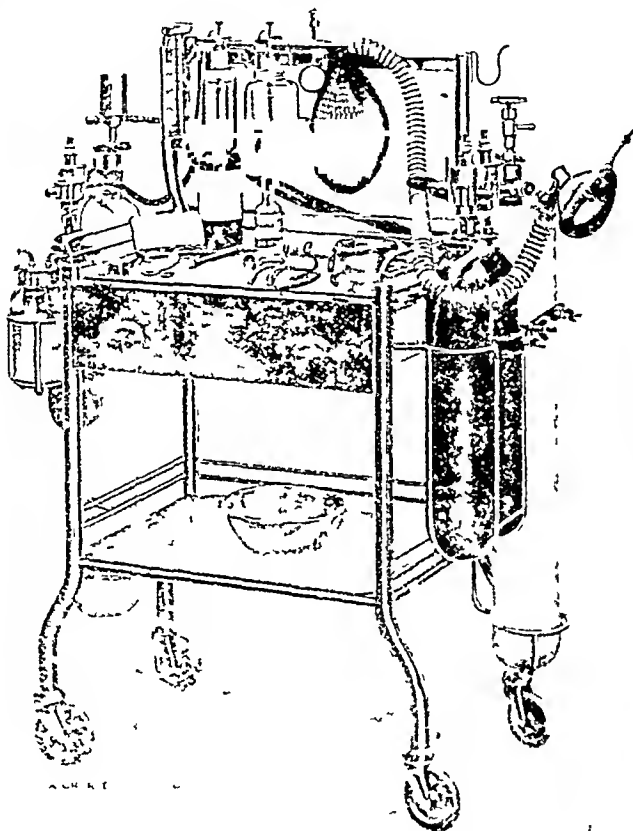
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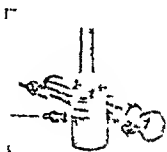
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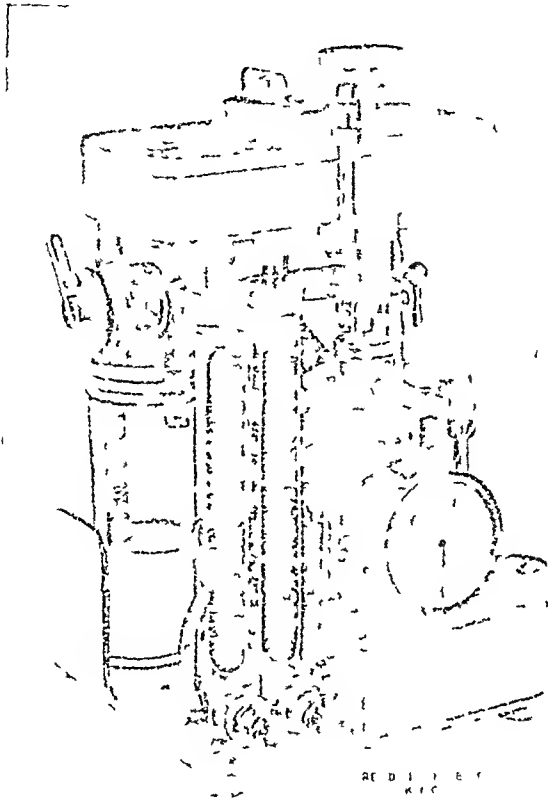


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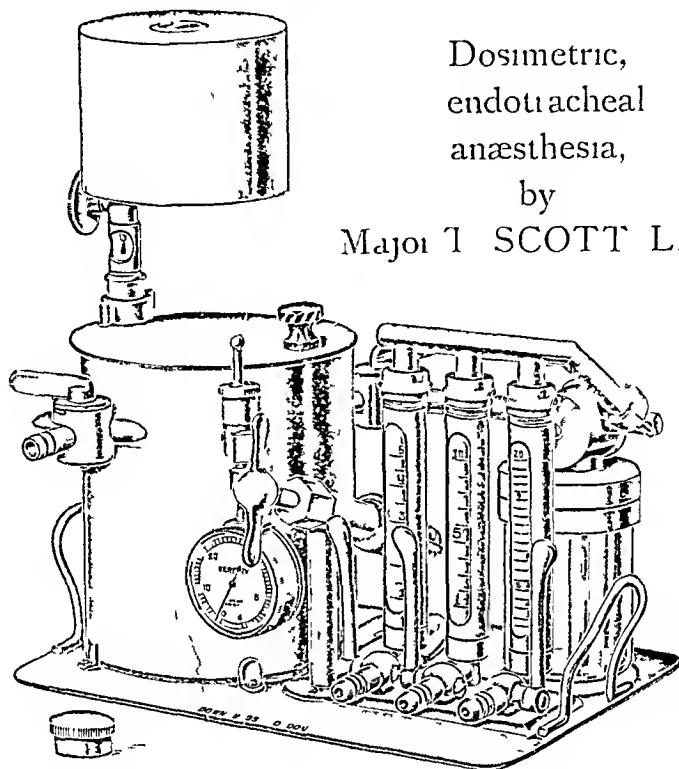
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# British Journal of Anæsthesia

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VOL. XIII No 2

JANUARY, 1936.

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## ANÆSTHESIA ITS PRESENT AND FUTURE

By W STANLEY SYKES, M B , B Ch

*Anæsthetist to the General Infirmary at Leeds and to the  
Hospital for Women, Leeds, late Anæsthetist to the Leeds  
Dental Hospital*

*(Continued from page 32)*

THE ideal scheme would be for a man to serve his apprenticeship as a resident before being eligible for the visiting staff (This is, of course, impossible at present because resident anæsthetists are unknown at the hospital in question and because the fees paid by surgeons with such mediæval ideas of anæsthesia are inadequate to tempt outsiders to take up the work on a whole-time basis) Then the surgeons would get reasonably satisfactory work from any newly appointed visiting anæsthetist. The resulting harmony and team work would be of benefit to all concerned, including the patient, that most important of all operating theatre inhabitants. Also, with resident anæsthetists available there would be some chance of "acutes" getting reasonably skilled anæsthesia, which at present they do not get.

Another practical defect is inherent in this system. A novice anæsthetist is always working with a surgeon of greater experience than himself—for novice surgeons are not allowed. Frequently the surgeon is very considerably the senior. This is a dangerous combination in the somewhat intolerant atmosphere of the operating theatre. Querulous demands from a senior for more relaxation are apt to be met by a panicky response and injudicious depth



of anæsthesia This not only happens with the dresser-administrator, but also with the junior visiting anæsthetist, because his knowledge, for the first year or two after his haphazard appointment, is little more profound than the student's But it definitely does not happen when a surgical team of no great discrepancy in seniority or experience works together constantly in hospital and in private

Again, in proper team work, the surgeon can concentrate wholly upon his own part of it, undisturbed by the thought of anæsthetic disasters So long as things are going well he will not be interrupted, but the experienced anæsthetist has no hesitation in informing him if circumstances warrant it The surgeon working with a novice is constantly worrying about the anæsthetic, to the detriment of his own technique, yet, do what he will, he cannot supervise it properly or efficiently Moreover, the novice will err in both directions Not only will he stop the surgeon for some imaginary or purely trivial emergency which ought never to have arisen, but he will probably fail to recognise and proclaim a real emergency when it occurs

The visiting anæsthetists in question are all part-time general practitioners This at once raises the point, general practitioner or specialist? (Of course, it is evident that in the smaller hospitals the whole of the staff must frequently be general practitioners These remarks apply only to large teaching hospitals situated in areas of dense population ) It has been said with some truth that a specialist is a man who knows more and more about less and less, and a general practitioner is a man who knows less and less about more and more Consequently, there is something to be said for a part-time specialist who is also in general practice He gets enough of his special work to acquire considerable skill and experience (though, as pointed out above, it should be obligatory to hold a resident post before appointment No man should be compelled to learn the rudiments of his work after his election to a senior post), while his general work preserves him from narrow-mindedness and develops his clinical instinct He is perhaps better than the specialist at rapid evaluation of condition and risk from personal appearance, and his knowledge may occasionally act as a check upon errors of diagnosis

For these reasons the custom (which is fairly common in large hospitals—in this department only, be it observed—from others the general practitioner is rigidly excluded) has certain advantages. But it also has its defects, the chief of which is the time factor. The average general practitioner is a busy man, especially if he adds to his practice several operating lists every week. Consequently, however enthusiastic he may be it is impossible for him to see the patients beforehand and to follow them up afterwards. This is a very serious defect which prevents full advantage being taken of the anæsthetist's experience and which effectually prevents useful research work. Proper record keeping (of the kind described below) is absolutely out of the question.

Those who are fortunate enough to see their patients beforehand as a routine do not perhaps realise the dilemmas which sometimes arise when the anæsthetist does not come in contact with the case until the actual moment of operation. The patient's physical and mental condition are unknown quantities, save for the knowledge gleaned from a rapid glance, and the risk involved has to be navigated by guess and by God. To give an example—not a theoretical one, but a case which occurs in actual practice—of the extreme danger to the patient inherent in this haphazard method. A patient is put on the operating list for an appendicectomy—the anæsthetist arrives and the operation begins. When the abdomen—that diagnostic lucky bag—is opened the surgeon finds a gastric ulcer. He promptly enquires whether the patient will stand a gastrectomy. The unfortunate anæsthetist is thus expected to answer a question of such vital importance—and the penalty for a wrong answer is death—without any previous examination of the patient. The absurdity and the unfairness of the situation is obvious—but only, apparently, to the anæsthetist. The patient, whom it concerns most closely, does not even know that such problems arise, the surgeon knows, but with certain honourable exceptions, does not do anything about it. The only conceivable reason for this neglect is an unworthy one—a preliminary examination would diminish his profits by a small amount.

There is another disadvantage in the general practitioner

anæsthetist system as at present worked in many hospitals, though this defect is not inherent in the system itself. The anæsthetists, who spend hours a week in practically gratuitous hospital work in order to improve their knowledge and skill, are generally paid general practitioner fees for private work, regardless of their special experience and regardless of money spent on expensive apparatus. Unlike the surgeons, they do not get private fees of compensatory magnitude. Many surgeons pay the same fee, and that a small one, to their hospital anæsthetist of twenty years' standing and to a newly qualified man whose experience is limited to a couple of dozen cases.

It may be argued that even if private fees are so small and so limited in number that the anæsthetist cannot make a living out of them, still they are a useful addition to general practice receipts. This is true, but this argument ignores the damaging effect of hospital work on general practice. Frequent and prolonged sessions in the operating theatre cause infinite harm to a practice, partly because of the inaccessibility of the practitioner and partly because of the time consumed.

Of recent years many hospitals have built private wards for paying patients, from whom the anæsthetists receive a small amount in fees. It is true that these are earned without appreciable extra work in that the cases are done in the course of the ordinary operating lists, but it is also true that they are often far too small. In one case hospital rules fix the surgeon's maximum fee at 25 guineas and the anæsthetist's fee at one guinea. This is out of all proportion and absurdly inadequate. Such a nominal rate, considering the limited number of private ward cases, provides merely an honorarium and is in no sense a recompense for the time spent in hospital.

More important still, for this point affects the welfare of the patient, these cases are paying fees with the deliberate intention of securing a high degree of skill and experience and a certain degree of personal care which they fear they might not receive in the public wards. From the surgical aspect they get what they pay for, because they are always, for obvious reasons, operated upon by the surgeon himself and never delegated to the house surgeons. But they are

not by any means certain of obtaining a fair deal as regards the anæsthetic. The fee is so small that it is not worth while for the visiting anæsthetist to make a special journey for emergencies, which are anæsthetised by the house surgeon. Alternatively, the house surgeon wants the fee himself, so he omits to telephone. Whatever the cause the acute cases pay the fees demanded (it is not their fault that they are inadequate to tempt an experienced man) in the pathetic and deluded belief that they are getting something rather special. In any other trade this practice would be stigmatised as false pretences and treated as such.

The medical profession ranks high in honour with the nations of the world, but if we have not an understanding heart then is our honour but a dishonourable sham. If we tolerate inferior service when dealing with lives entrusted to our care in simple good faith then we are perpetrating a fraud upon the public, and a fraud which stands out above all others in its meanness and iniquity because the victims do not even know that they are defrauded. A future of increasing interest and greater safety awaits the art of anæsthesia if only the eyes of the surgical and lay public can be opened, if only they can be brought to realise that good anæsthesia is worth having and that better anæsthesia is worth striving for and incidentally worth paying for.

Under the rule of the god-of-things-as-they-are the ideals of many potentially keen anæsthetists are extinguished, and the flaming enthusiasm which might so easily lead to advancing knowledge and efficiency is damped down by the dead and paralysing weight of economic pressure. It is a small matter as far as the anæsthetists are concerned, for a man or woman on the Medical Register can make a living with perhaps greater certainty than any other trade or profession in the world. But above all things and beyond all things it is our sacred duty to work for the restoration of the obsolescent but rather noble ideal which was the strength and glory of our profession in the days of the Hippocratic oath—that the welfare of the patient outweighs every other consideration whatsoever.

Surgical fees were ever extortionate, but with pitiful eagerness the patients demand the best and pay for it unto the uttermost farthing. It is a tragedy of infinite pathos

that, having paid, it should be denied them in order that a few guineas may be saved out of an already large fee. So long as this attitude of mind persists so long will the much vaunted reputation of modern surgery continue to be mere bally-hoo for advertisement purposes.

This paper will not deal with the problem of unpaid anæsthetists attached to professorial units with salaried surgeons, from whom there is no chance of earning private fees, because it so happens that the writer has not visited any hospitals where this system is in force. In the absence of evidence to the contrary, therefore, he is bound to assume that this particular problem affects the anæsthetist only and has no adverse bearing upon the patient. The purpose of the present essay is to deal only with matters which affect the patient, directly or indirectly.

The question now arises, can the average operative mortality be reduced, and if so by what means can we advance along this pathway to great adventures and limitless service? In an attempt to find out what the average mortality is I chose one of the hospitals to which I am attached because its statistics were easily accessible. It is large, it deals with all types of case, it has a high reputation and may be taken as a fair representative of the voluntary general hospitals.

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1925	4.91%	1929	4.82%
1926	4.09%	1930	4.31%
1927	3.74%	1931	3.92%
1928	4.20%		

Considering the amount of major surgery (about 30 per cent of abdominals) and bad risks the results seem good at first sight and are probably not inferior to those of most hospitals. But is it possible to reduce this average of 4.28 per cent? Do any other hospitals in fact contrive to undercut it? An answer is given in the statistical reports of the Rotherham Hospital, where the operation list reaches the

\* These figures include, for both hospitals, both immediate and remote mortality—that is, deaths on the table and deaths *after operation* while the patient is still in hospital. The latter are not so dramatic, but they are just as important.

smaller but still respectable total of 1,200 a year. The Rotherham death rate has been reduced in the following striking manner.

1925	4 4%	1929	1 9%
1926	4 0%	1930	1 0%
1927	3 8%	1931	1 7%
1928	3 9%		

It will be seen that the mortality rate was very much the same for both hospitals up to and including 1928, but that Leeds has not improved at all, unlike Rotherham, which has reduced its death rate by an average figure equivalent to 2.346 per cent of the total number of operations. Now 2.346 per cent on the average operation figures of all hospitals with a mortality rate in the region of 4-5 per cent represents a very large number of human lives.

These two series of statistics cover long periods and are of considerable magnitude. Moreover they are strictly comparable. I personally interviewed the compiler of the Rotherham figures before collecting my own, and great care was taken that the methods used were exactly the same. The remarkable consistency and steadiness of the pre-1929 death rates is all in favour of their reliability. In both series the percentage of abdominals was about the same.

The first problem to be solved is the surgeon or the anæsthetist at fault? It is not argued that Rotherham surgeons are better than Leeds surgeons—the Rotherham improvement was solely due to anæsthetic reforms, other conditions remaining the same.

A recent visit to the United States gave me the impression that the surgery I saw there was similar to the average English standard, but the anæsthetic organisation, personnel, equipment and tuition were incomparably superior in every way. This refers to Madison, Wisconsin, and Toledo, Ohio, admittedly chosen for visits because of their outstanding anæsthetic reputation. Not all American hospitals are up to this high standard, but the inferior ones can be ignored. Only the best are good enough to learn from and to imitate.

On my trip I saw many details of hospital organisation which could be adopted here with great advantage to the

comfort and safety of the patients, to the reputation of the hospitals and to the ultimate profit of the surgical staff. It will be convenient to describe first the anæsthetic organisation perfected by Dr Ralph M. Waters at the State of Wisconsin General Hospital at Madison, and then the Toledo technique of Dr E. I. McKesson.

A The State of Wisconsin General Hospital contains about 600 beds. The anæsthetic staff consists of Dr R. M. Waters as chief, with two permanent assistants and two assistants appointed for a year. All these are whole-time appointments, but the seniors can take private anæsthetic work, most of which is done in the hospital and which causes no departure from the usual routine.

(a) *Pre-operative routine at Madison*

When time permits, that is in every case except the most urgent, the names of patients for operation are sent to the anæsthetist's office beforehand. It is the duty of the anæsthetist to visit each case prior to operation and to fill up from the notes and from personal examination a very complete record of the patients' physical condition on a special form supplied for the purpose. At the same time he orders whatever preliminary medication he thinks fit. This examination ensures that a record is kept, which is of real value for statistical purposes, and it also allows the anæsthetist an opportunity to estimate the risk he is to undertake and to obtain valuable information which may affect the choice of technique, etc. Contrast with this forethought and care the haphazard method by which the anæsthetist does not see the patient at all until he arrives in the theatre.

(c) *Madison procedure during operation*

Blood-pressure readings are taken during operation as a routine, so that the patient's condition, already familiar to the anæsthetist, is constantly under observation. These readings are no trouble, as carried out in this hospital. The sphygmomanometer armband and the stethoscope tambour are strapped in position beforehand by the porter, and the armband is automatically inflated by the gas machine when necessary. The blood-pressure readings, together with many other details, are recorded on the anæsthetic chart previously mentioned, which accompanies each patient to

the theatre Needless to say, in a hospital where the patient's safety is considered with such extreme care no unsupervised student is ever permitted to give an anæsthetic

(c) *Post-operative routine*

All cases are seen by the anæsthetist after operation and the visits repeated if necessary for the completion of the anæsthetic record The anæsthetist is also called in to see any cases of post-anæsthetic complications. This follow-up work is of great importance in risk-estimation If the anæsthetist does not see the results of his work, as in so many English hospitals, his judgment as to patients' condition can never improve The value of his years of previous experience is, in this respect, practically nil

(d) *Records*

The record sheets at Madison, which are filled up before, during and after operation, find their way when complete to the anæsthetists' office Here, by means of a simple little machine, a card is punched to correspond with each one The record is then bound with the case papers and the card filed in the office Each card contains no less than 450 positions for punch holes, so that an enormous amount of information is recorded quickly by this system When large numbers of cards have been accumulated any desired information can be extracted from them very rapidly by passing them through a sorting machine

The cause of "epidemic" accidents or complications in surgery or anæsthesia may be detected from the cards Accurate comparative studies may be made showing the advantages (if any) of changes of method or technique By this system and thus alone can the value of small alterations be judged with reference to the ultimate criterion of all surgery—the death rate

(e) *Research at Madison*

Each anæsthetist is responsible for reading certain journals and publications from which he picks out and summarises articles of anæsthetic interest The whole staff is thus kept informed of day-to-day progress

There is close co-operation between the anæsthetic staff and the physiological and pharmacological departments of the University of Wisconsin It was here that the carbon dioxide absorption method was developed from a casual



pharmacological suggestion into a practical and useful anæsthetic technique. It was here also that several years of combined research on animals resulted in the introduction of cyclopropane, a new gas of great promise, which at the time of my visit was in actual use in the operating theatres (Incidentally the card system will enable the advantages and disadvantages of cyclopropane to be accurately compared with the older methods in scores of different ways. Its true position in the anæsthetist's armamentarium will not take eighty years to solve, as did the controversy between ether and chloroform.)

(f) *Tuition*

This is very thorough. All students are put through an intensive course of anæsthesia and operative surgery on animals before being allowed to try their hands upon human patients. This is a distinct improvement on our method of allowing them to practise upon the poorer members of the community. Finally, all students devote five weeks' full time to human anæsthesia.

(g) *Equipment*

This is on a lavish scale. Even in the County hospitals, which roughly correspond to our Workhouse Infirmaries, anæsthetic gases are piped to the operating theatres from a central supply room. This relieves the anæsthetist of all anxiety about shortage of gas during an operation and of the necessity for changing cylinders. No gas machine depending on small cylinders for its supply is any use for hospital work. The cylinders are left partly empty or completely empty by other users, and it is always necessary before using, and frequently during an operation list, to test and change them. This is such an intolerable nuisance that gas machines are rarely used under such conditions, even if available. In America the standard size is 3,000 gallons, which is fitted and forgotten for fifty or sixty hours of use. This point is more important than it sounds in obtaining efficient work. Also, gas in large cylinders is cheaper than in small ones.

In the Madison hospitals there were thirteen Foregger gas machines and two McKessons. Contrast with this the meagre equipment of the average British institution.

The department of anæsthesia in American hospitals has

charge of all apparatus for oxygen therapy and resuscitation—the Drinker respirator, which mechanically performs artificial respiration in cases of paralysis or respiratory failure, oxygen tents with their soda lime purifiers and refrigerators, and the specially built oxygen rooms, where patients can be nursed for weeks if need be in an atmosphere of almost pure oxygen

*B The Toledo technique*

McKesson has always claimed that all cases and all patients can be dealt with by gas and oxygen alone, with its advantages of increased safety and non-toxicity, rapid recovery and absence of after-effects. This claim appeared to be exaggerated, because no one seemed to be able to employ gas and oxygen so successfully. As generally used it has very severe limitations owing to its lack of power.

McKesson's claim is, however, perfectly correct. I have seen him use it, and in his hands it achieves the impossible and does all that he claims. While this degree of expertness cannot be expected from everybody, there is no doubt that gas and oxygen can be given in a far wider range of cases than generally thought possible, if only the Toledo technique is learnt. Seventy-four per cent of my last 150 private cases have had gas and oxygen alone and a good many of the remainder gas and oxygen with minimal amounts of ether. Given even moderate skill in its use no non-abdominal case need suffer the unpleasantness and risk of ether or chloroform, and with increasing practice a large proportion of abdominals can also be spared this risk.

*It was by the wholesale use of gas and oxygen in this manner that the Rotherham mortality was reduced so markedly*

In order to use gas and oxygen (as distinct from gas-oxygen-ether or gas-oxygen-chloroform) McKesson's apparatus is essential. I had the opportunity of carefully examining and actually using other makes while in America and I have also used other British makes, but I am convinced that all of them are very much inferior to it in efficiency, convenience, and workmanship.

With anæsthetics such as ether or chloroform simple improvised apparatus can be used with success, but with gas and oxygen instruments of precision are absolutely

essential. A machine which will deliver oxygen in steps of approximately 20 per cent are not good enough, any more than a coal-waggon weighbridge is good enough for dispensing purposes. A given patient may require seven per cent of oxygen, no more and no less. With five per cent he is dangerously anoxæmic and with nine per cent he is not properly under. One reason why so many are unable to get satisfactory results from the use of nitrous oxide without the addition of ether in the majority of cases is the use of inefficient apparatus which will not deliver accurate and constant percentage mixtures, regardless of variations in flow from the cylinders. Accuracy to one per cent is necessary.

### CONCLUSIONS

1 It is possible to reduce post-operative mortality below the 4-5 per cent average

2 There are many defects in the anæsthetic departments of different hospitals, and until these are remedied the operative death rate will always be higher than it need be. These defects constitute a grave blot on twentieth-century surgery

3 The ideal reform would be to adopt in its entirety the almost perfect Madison organisation, but replacing continuous flow machines by McKesson's, used as they are used at Toledo. For safety and all-round efficiency the hospital which did this would lead the world

4 If such changes are impossible then certain minimum essentials are required to create a satisfactory service

(a) Resident anæsthetists should be appointed at all large hospitals without exception

(b) No person should be appointed as visiting anæsthetist without previous experience as resident, thus bringing anæsthesia into line with all other branches of medicine and surgery

(c) Anæsthetic clerkships should be compulsory for the better instruction of students

(d) It should be an absolute rule that no dresser is allowed to give an anæsthetic except under direct supervision

(e) Patients in private wards should invariably get what they pay for—the personal care of an experienced

anæsthetist Under no circumstances should the same fee be payable to a senior member of the staff and to a newly qualified house surgeon.

(f) The equipment of many hospitals requires drastic overhaul Good modern gas machines should always be available

(g). These machines, though robust, are not fool-proof Therefore, no one except people familiar with their construction and mechanism should be allowed to use them or they will never be in working order (Nor will satisfactory anæsthesia be obtained ) Financial considerations in the form of repair bills may thus do what the interests of the patient have failed to do, that is, protect patients against the dangers of unskilled and unsupervised anæsthesia

(h) As the science of anæsthesia is constantly changing and constantly advancing, in common with the rest of medicine and surgery, provision should be made so that suggestions for reforms and improvements could be brought to the notice of the governing body without loss of time

# APPENDIX

A few more figures of interest from the Rotherham reports

	1st Period 1925-1928			2nd Period 1929-1931		
	Ether and Chloroform			Gas and Oxygen largely used		
	Cases	Deaths	Mor tality	Cases	Deaths	Mor tality
Hysterectomy	71	8	9 7%	48	0	0%
Gall Bladder operations	81	9	10 1%	61	2	3 2%
Appendicectomy	696	23	3 3%	482	4	8%
Total in-patient operations	4721	183	3 876%	3770	58*	1 53%

The surgical staff was the same all the time

I have to thank Dr E J Chambers of Doncaster for the loan of these reports He, like myself, is a gas and oxygen enthusiast, but his figures are uncontaminated by enthusiasm They are taken from the annual reports of the hospital, in the compilation of which anæsthetists take no part whatever

## THE JOURNAL'S PRIZE ESSAY

THE Editorial Board has decided to offer another prize, value ten pounds, for the best essay on any subject directly concerned with the administration or the physiology of anæsthetics

The essays must reach the Editor of the *Journal* on or before August 31st, 1936, should not exceed four thousand words in length, and must be typed or written on one side of the paper only. The Board claims the right to publish any of the essays submitted. Candidates must hold a medical qualification within the British Empire

## THE DIPLOMA IN ANÆSTHETICS

THE following practitioners, in addition to those whose names were published previously, were granted the diploma under the regulation permitting this without examination: G F V Anson, Herbert Charles, L T Clarke, Elsie C Hanson, O J Murphy, J D Stewart, L N Routh, S T Rowling

The first examination was held on November 8th and subsequent days. The list of successful candidates is as follows —

H K Ashworth, M B, Ch B (Manch), L R C P, M R C S  
 J H Atwood, M B, B S (Lond), L R C P, M R C S  
 A Barnsley, M D, B Chir (Camb), L R C P, M R C S  
 C A Borland, M B, Ch B (Glasgow)  
 Lorna Bray, M B, B S (Melb)  
 H J Brennan, M B, Ch B (Manch)  
 R J B Broad, L R C P, M R C S  
 A I P Brown, M B, B S (Lond), L R C P, M R C S  
 F F Cartwright, L R C P, M R C S  
 T H Chadwick, M B, Ch B (Manch)  
 D J Davies, M B, B S (Lond), L R C P, M R C S  
 Winifred Dean, M B, Ch B (Manch)  
 H G Dodd, M B, B S (Durham)  
 N A Gillespie, D M, B Ch (Oxon)  
 J Gillies, M B, Ch B (Edin)  
 A P Gorham, M B, Ch B (Bristol), L R C P, M R C S  
 R B Gould, M B, Ch B (Sheffield)  
 H F Griffiths, M D, B Ch (Camb), L R C P, M R C S

Gwendolen Harrison, M B , Ch B (Leeds)  
 G Hochschild, L R C P , M R C S  
 Mary J Hudson, M B , Ch M (Sydney)  
 R Jarman, L R C P , M R C S  
 E F Johnson, M B , B S (Lond ), L M S S A (Lond )  
 Alison R Kerridge, L R C P , M R C S  
 L H Lerman, L R C P , M R C S  
 A Lucas, L M S (Ceylon), D T M & H (Eng ), L R C P & S ,  
 (Edin ), L R F P S (Glas )  
 W S McConnell, M B , B S (Lond ), L R C P , M R C S  
 Jean Small Blair McNeil, M B , Ch B (Edin )  
 S V Marshall, M B , Ch M (Sydney)  
 E A Marson, M B , Ch B (Manch )  
 A G Miller, M B , Ch B (Glasgow)  
 J C Nicholson, M B , Ch B (Manch )  
 M D Nosworthy, M D , B Ch (Camb ), L R C P , M R C S  
 E A E Palmer, M B , B Ch (Camb ), L R C P , M R C S  
 B Rait-Smith, L R C P , M R C S  
 E H Rink, B M , B Ch (Oxon ), L R C P , M R C S  
 F W Roberts, M B , B S (Lond ), L R C P , M R C S  
 K MacD Ross, M B , B S (Lond ), L R C P , M R C S  
 Doris M Sanders, M B , Ch B (Birm )  
 J D Scott, L R C P , M R C S  
 E V Slaughter, L R C P , M R C S  
 C E Sykes, M B , Ch B (Manch )  
 Sheina Cooper Helen Watters, M B , Ch B (Edin )  
 J H West, L R C P , M R C S  
 Rose Eleanor Williams, L R C P , M R C S  
 F C Wright (Surg -Com R N ), L R C P , M R C S

As some guide for future candidates we here append a few of the questions from the paper set in the first examination

Give the points for and against spinal anæsthesia  
 Describe the technique that you employ, with doses

You are called to a case of intestinal obstruction with almost constant vomiting It is decided to do an exploratory laparotomy What will you do ? Describe in detail

Write a short essay on the history and present position of rectal anæsthesia and analgesia

What premedication and anæsthetic would you employ in a case of bad toxic goitre ?

# INVESTIGATIONS INTO THE UREA NITROGEN CONTENT OF BLOOD FOLLOWING ANÆSTHESIA

By EILEEN A BOYD, M B , B Ch (*Dublin University*)  
(*Research Assistant, The Devonport Pathological  
Laboratories, Greenwich, S E 10*)

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## INTRODUCTION

By RONALD JARMAN, M R C S , L R C P  
(*Late Anæsthetist The Dreadnought Hospital, Greenwich*)

THE following work was undertaken with the object of finding out if any changes in urea nitrogen content of the blood were produced by spinal anæsthesia, and whether or not there was any definite advantage in giving an inhalation anæsthetic rather than a spinal

A series of normal controls was tested against a series of patients anæsthetised by various methods, e g by chloroform, ether, stovaine and percaine spinal. The results obtained are of value inasmuch as the physician and surgeon in charge of any patient may know that certain types of anæsthesia do not produce any alteration in the urea nitrogen content of the blood, even if pathological changes in the kidneys are present. Referring to the results from ether anæsthesia, it will be seen that there are definite signs that this anæsthetic does bring about changes in the blood chemistry. This is confirmed by Dr Shackle's findings.

The investigation is of value in showing that some types of anæsthetic do not produce any changes outside the normal range in the urea nitrogen content of the blood, and that of all types of anæsthetic, nitrous oxide and oxygen produces the minimum changes in the blood chemistry.

Reference has been made in previous communications<sup>1</sup> to the absence of toxic effects during anæsthesia by nitrous oxide and oxygen.

<sup>1</sup> Jarman *British Medical Journal* May 5, 1934

THE following records a series of investigations into the urea nitrogen content of the blood of patients at The Dreadnought Hospital, Greenwich, before and twenty-four hours after administration of general and spinal anæsthesia, with 50 non-surgical cases as controls. They were carried out on the suggestion of Dr Ronald Jarman.

The patient's fasting blood was taken on the morning of the operation before any premedication.

A second specimen was taken the following day, approximately twenty-four hours after administration of anæsthetic.

### *Technique*

A colorimetric micro-technique was employed. A 0.2 cubic centimetre of finger-prick blood is taken directly into a centrifuge tube containing one cubic centimetre of distilled water, and 0.3 cubic centimetre of urease solution added. (Urease solution is prepared by grinding up one urease tablet with five cubic centimetres of distilled water.) The tube is then incubated in a water bath at 57°C for half an hour.

The proteins are precipitated with 0.3 cubic centimetre each of  $\frac{2}{3}\text{NH}_4\text{SO}_4$  and 10 per cent sodium tungstate, the volume made up to eight cubic centimetres and the whole centrifuged.

To five cubic centimetres of the resulting clear supernatant fluid (containing 0.125 cubic centimetre of blood), are added two cubic centimetres of Nessler's reagent and a reading made immediately against a solution of ammonium sulphate containing 10 milligrams per cent of ammonia nitrogen Nesslerised in the same manner.

Fifty cases of chloroform and ether anæsthesia, fifty cases of stovaine and forty-three cases of percaine were examined. Fifty medical cases were used as controls, their ages varying between twenty and fifty. None of the patients showed any renal abnormality and they could be assumed to have a normal blood urea nitrogen content—12-15 mgm per cent. Their fasting blood was taken at the same hour in the morning on two consecutive days.

In the controls it was found that only four per cent gave



identical readings In the remainder there was a daily variation of moderate amount, either a decrease or an increase, as detailed below

Both in cases of general and spinal anæsthesia, a moderate variation in the blood urea nitrogen content was demonstrated as detailed below

### *Controls (50 cases)*

Twenty-five cases, 50 per cent showed an average decrease in the urea nitrogen content of 2.9 mgm per cent

Maximum decrease 10.4 mgm per cent

Minimum decrease 0.3 mgm per cent

Twenty-three cases, 46 per cent gave an average increase of 3.3 mgm per cent

Maximum increase 9.2 mgm per cent

Minimum increase 0.2 mgm per cent

Two cases, or four per cent, gave identical readings on two consecutive mornings

### *Chloroform and Ether (50 cases)*

Thirty-one patients, or 62 per cent, showed an increase in the urea nitrogen content of their blood twenty-four hours after operation The average increase was 3.8 per cent

Maximum increase 19 mgm per cent

Minimum increase 0.3 mgm per cent

In sixteen patients, 32 per cent, the urea nitrogen was decreased The average decrease being 1.9 mgm per cent

Maximum decrease 7.2 mgm per cent

Minimum decrease 0.2 mgm per cent

Three cases, or six per cent, showed no change

### *Stovaine (50 cases)*

Twenty-six cases, or 52 per cent, had increased urea nitrogen values after operation, averaging 3.7 mgm per cent

Maximum increase 9.5 mgm per cent

Minimum increase 0.6 mgm per cent

Nineteen cases showed a drop in the urea nitrogen content the day following operation, averaging 2.7 mgm per cent

Maximum decrease 9.6 mgm per cent

Minimum decrease 0.5 mgm per cent

Five cases, or 10 per cent, showed no change

*Percaine* (43 cases)

In twenty-two, or 51 per cent, of the cases investigated a rise in the blood nitrogen was noted, averaging 3 mgm per cent

Maximum increase 8.5 mgm per cent

Minimum increase 0.4 mgm per cent

Sixteen cases, or 37.3 per cent, had a lowered urea nitrogen content following operation, averaging 1.6 mgm per cent

Maximum decrease 5.5 mgm per cent

Minimum decrease 0.2 mgm per cent

Five cases, or 11.5 per cent, gave identical readings

In the majority of these cases the food intake on the day following operation was negligible. Actually many of the cases who had had dinner at midday had a lower blood urea nitrogen content than those who had had no dinner

No opportunity was afforded for investigating cases of ether anaesthesia, but Shackle<sup>2</sup> reports a considerable rise in twenty-seven out of thirty-five cases undergoing gynaecological operations at Guy's Hospital with induction by ethylchloride and chloroform and ether. He found increased values up to 41 mgm per cent, with an average of 21 mgm per cent

Pitt<sup>3</sup> has studied the influence of avertin anaesthesia on the renal function and found a slight rise in the blood urea following administration of avertin with nitrous oxide and oxygen, and a greater rise after avertin with ether and chloroform

### CONCLUSIONS

The average rise in the urea nitrogen content of the blood of all cases under examination is no greater than the average daily variation in normal controls. It is, however, apparent from the table given below, that a greater percentage of cases of inhalation anaesthesia than of spinal anaesthesia shows this increase. It is also demonstrated that the average rise in milligrams per cent of urea nitrogen is slightly greater following general than spinal anaesthesia

<sup>2</sup> Shackle *Journ Clin Research*, Oct., 1932, p. 138

<sup>3</sup> Pitt *Lancet* March 30, 1935, p. 741

	Controls CHCl <sub>3</sub> Stovaine Percaine			
Increase per cent	46	62	52	51
Decrease per cent	50	32	38	37.3
Average rise in mgms per cent				
Urea N	3.3	3.8	3.7	3.0

## CONTROLS (NO ANÆSTHESIA)

Case	Mgm of Urea N		Mgm of Urea M	
	1st Day	2nd Day (24 hrs)	Increase	Decrease
1	13.3	18.8	5.5	
2	14.5	17.0	2.5	
3	26.6	16.0		9.5
4	15.2	14.5		0.7
5	8.2	12.3	4.0	
6	20.0	14.4		5.6
7	22.8	20.0		2.8
8	13.3	12.0		1.3
9	16.6	11.8		4.8
10	10.0	15.2	5.2	
11	15.2	17.7	2.5	
12	16.0	14.5		1.5
13	9.4	9.0		0.4
14	10.6	10.0		0.6
15	16.0	15.2		0.8
16	12.3	10.7		1.6
17	11.4	11.8	0.4	
18	12.3	13.3	1.0	
19	10.7	14.0	3.3	
20	17.0	14.0		3.0
21	12.5	15.2	4.7	
22	9.3	12.3	3.0	
23	14.0	20.0	6.0	
24	14.5	11.4		3.1
25	14.5	16.0	1.5	
26	16.0	14.0		2.0
27	14.6	12.5		2.1
28	13.0	15.2	2.2	
29	20.0	13.3		6.7
30	15.2	16.6	1.4	

CONTROLS (NO ANÆSTHESIA) (*continued*)

Case	Mgm of Urea N		Mgm of Urea M	
	1st Day	2nd Day (24 hrs)	Increase	Decrease
31	16 0	15 1		0 9
32	14 0	20 0	6 0	
33	18 8	17 7		1 1
34	16 0	16 2	0 2	
35	16 0	16 0	—	—
36	25 3	21 3		4 0
37	20 0	21 3	1 3	
38	22 8	22 8	—	—
39	10 6	13 0	2 4	
40	9 0	14 0	5 0	
41	11 0	14 5	3 5	
42	14 0	17 7	3 7	
43	22 8	17 0		5 8
44	12 8	20 0	9 2	
45	9 4	9 1		0 3
46	14 4	16 3	2 0	
47	13 4	11 8		1 6
48	16 0	13 9		2 1
49	17 0	16 7		1 7
50	25 6	15 2		10 4

## CHLOROFORM AND ETHER

Nature of operation	Mgm Urea N %		Mgm Urea N %	
	Before	After (24 hrs)	Increase	Decrease
Partial gastrectomy	12 3	17 0	4 7	
Appendicectomy	32 0	32 0	—	—
Reduction of fracture	20 0	26 6	6 6	
Fibro adenoma of breast removed	10 7	11 8	1 1	
Insertion of radium	20 0	26 0	6 0	
Appendicectomy	20 0	20 0	—	—
Tonsils and adenoids	22 8	26 8	4 0	
Excision of cartilage	11 8	15 0	3 2	
Excision of cartilage	15 2	20 0	4 8	
Hernia	11 4	19 0	6 6	
Excision of lipoma	11 4	15 2	3 8	
Hernia	10 6	9 0		0 4

CHLOROFORM AND ETHER (*continued*)

Nature of operation	Mgm Urea N %		Mgm Urea N %	
	Before	After (24 hrs )	Increase	Decrease
Reduction of fracture	12 8	11 9		0 9
Removal of sphenoid	12 3	11 4		0 9
Tonsils and adenoids	14 4	22 8	6 2	
Tonsils and adenoids	13 3	17 0	2 7	
Mastoid	11 8	15 0	3 2	
Mastoid	14 8	16 0	1 2	
Tonsils and adenoids	11 4	13 3	1 9	
Mastoid	16 8	14 5		2 3
Tonsils and adenoids	11 0	11 8	0 8	
Tonsils and adenoids	12 3	17 3	5 0	
Tonsillectomy	13 3	20 0	6 7	
Tonsillectomy	11 4	16 0	4 6	
Bursa excised	12 8	12 3		0 5
Hernia	16 0	15 4		0 6
Hernia	11 8	14 5	2 8	
Hernia	11 8	13 9	2 1	
Hernia	14 0	24 0	10 0	
Amputation of finger	15 7	11 8		4 0
Removal of sequestrum	11 0	11 0	—	—
Gastric ulcer	9 1	13 3	4 2	
Mastoid	14 5	13 9		0 6
Tonsils and adenoids	11 8	12 3	0 5	
Tonsils and adenoids	24 0	16 8		7 2
Tonsils and adenoids	13 9	11 9		2 0
Appendicectomy	11 4	12 3	0 9	
Hernia	11 6	11 4		0 2
Reduction of fracture	11 8	13 9	1 9	
Hernia	11 6	10 0		1 6
Oesophagoscopy	16 8	12 3		4 5
Tonsils and adenoids	7 0	12 0	5 0	
Tonsils and adenoids	8 8	10 6	1 8	
Hernia and appendicectomy	12 8	10 2		2 2
Tonsillectomy, osteomyelitis drained	10 6	16 0	5 4	
Oesophagoscopy	9 0	12 8	3 4	
Tonsils and adenoids	15 4	14 9		0 5
Osteomyelitis drained	11 4	21 4	10 0	
Amputation of cervix	12 3	11 5		0 8
Amputation of breast	8 8	9 1	0 3	

## STOVAINE

Nature of operation	Mgm Urea N %		Mgm Urea N %	
	Before	After (24 hrs )	Increase	Decrease
Hernia	17.3	16.8		0.5
Hernia	10.6	11.6	1.0	
Papilloma of bladder	20.0	24.0	4.0	
Varicocele	13.9	17.3	3.4	
Injection of hæmorrhoids	17.7	21.4	3.7	
Hallux valgus	26.6	16.8		9.6
Hallux valgus	16.0	17.0	1.0	
Hernia	17.7	22.8	5.1	
Hernia	14.8	15.4	0.6	
Anal fistula	13.3	22.8	9.5	
Hernia	12.3	12.3	—	—
Hæmorrhoids and urethral stricture	24.0	21.4		2.6
Hernia (bi-lateral)	13.3	20.0	6.7	
Cystoscopy	21.4	22.8	1.4	
Carcinoma of colon	13.9	15.4	1.5	
Hernia	17.7	20.0	2.3	
Hernia	20.0	17.0		3.0
Hæmorrhoids ligatured	17.7	22.8	5.1	
Hernia	13.9	13.9	—	—
Hernia	17.5	11.4		6.1
Hernia	16.0	26.6	9.4	
Cystoscopy	17.3	24.8	7.5	
Hernia	11.8	12.8	1.0	
Hernia	17.7	17.7	—	—
Hydrocele of cord	14.5	13.9		0.6
Hernia	16.8	15.7		1.1
Hernia	14.8	13.3		1.5
Hernia	12.8	10.6		2.2
Cystoscopy	12.3	13.3	1.0	
Hernia	13.1	9.0		4.1
Fistula in ano	14.5	12.3		2.2
Hernia	12.3	9.1		3.2
Hernia	18.0	14.2		3.8
Hernia	16.3	12.3		4.0
Bursa of knee excised	9.0	9.0	—	—
Hernia~	10.0	16.0	6.0	
Hernia	11.8	13.9	2.1	
Hallux valgus	10.6	15.4	4.8	

STOVAINE (*continued*)

Nature of operation	Mgm	Urea N %		
	Before	After (24 hrs )	Increase	Decrease
Varicocele Radical cure	10 6	13 1	2 5	
Hernia*	11 0	12 8	1 8	
Hernia	9 6	12 8	3 2	
Hernia	10 0	10 6	0 6	
Hernia	10 0	11 0	1 0	
Hernia	16 0	16 0	—	—
Hydrocele of cord	16 0	14 2		1 8
Hernia	13 3	11 4		1 9
Removal of plate	11 2	10 0		1 2
Hernia	10 6	10 0		0 6
Hernia	14 5	8 1		6 4
Cystoscopy	32 0	40 0	8 0	

\* Plus C and E

## PERCAINE

Nature of operation	Mgm	Urea N %		
	Before	After (24 hrs )	Increase	Decrease
Septic knee incised	10 3	11 0	0 7	
Hernia	11 0	16 0	5 0	
Skin graft	22 8	22 8	—	—
Hernia	11 6	12 5	0 9	
Hernia	13 9	17 1	3 2	
Proctoscopy	11 6	14 5	3 0	
Hernia	10 6	14 5	4 1	
Hæmorrhoids	10 6	16 8	6 2	
Hallux valgus	12 3	11 8		0 5
Hernia	12 3	12 3	—	—
Hæmorrhoids	12 8	13 9	1 1	
Hernia	16 5	11 5	—	5 0
Hernia	13 9	14 5	0 6	
Appendicectomy	10 0	13 9	3 9	
Prostatectomy	10 3	18 8	8 5	
Appendicectomy	9 0	12 3	2 7	
Hallux valgus	16 2	16 0		0 2

PERCAINE (*continued*)

Nature of operation	Mgm Urea N % Before	Mgm Urea N % After (24 hrs )	Mgm Urea N % Increase	Mgm Urea N % Decrease
Hernia	12 8	12 8	—	—
Hæmorrhoids	14 2	13 9		0 3
Hernia	16 0	12 3		3 7
Hernia	18 8	15 2		3 6
Hernia	15 4	14 5		0 3
Hernia	14 8	14 5		0 9
Hysterectomy <sup>†</sup>	11 3	16 3	5 0	
Hernia	11 4	12 3	0 9	
Hernia	13 3	13 3	—	—
Nephrolithotomy	14 4	14 0		0 4
Nephrolithotomy	14 4	13 9		0 5
Cystoscopy	12 9	11 4		1 3
Appendicectomy	14 2	14 6	0 4	
Removal of uretic calculus	13 3	13 1		0 2
Carcinoma of rectum excised	9 0	14 5	5 5	
Cystoscopy	10 0	12 3	2 3	
Colostomy	15 2	14 5		0 7
Appendicectomy	9 1	9 1	—	—
Scrotal hernia	28 6	29 0	0 4	
Catheterisation	15 2	12 3		0 9
Appendicectomy	11 4	15 0	3 6	
Appendicectomy	12 3	14 5	2 2	
Gastro enterostomy	20 0	14 5		5 5
Nephrectomy	9 0	12 3	3 3	
Nephrectomy	9 4	13 3	3 9	
Appendicectomy	12 3	10 5		1 6

<sup>†</sup> Plus Gas and Oxygen

My best thanks are due to the Honorary Surgeons of the Dreadnought Hospital, Greenwich, for permission to investigate their cases, to the Director of the Devonport Pathological Laboratories, Greenwich, for affording me laboratory facilities, and to the Seamen's Hospital Aid Committee for a grant to carry out this research



## COMBINED EVIPAN-NOVOCAINE ANÆSTHESIA

By GEORGE BANKOFF, M D , D Ch , F A Ch (Germany)

THERE is hardly any field in Medicine where more innovations or experiments have been tried than in the field of anæsthesia. This is certainly due to the fact that anæsthesia plays an important part in the success of a surgical operation. Very often the surgeon is faced with problems regarding the low general condition of the patient, with individual sensibility or diseases which, although having no direct connection with the operation itself, handicap its performance. For this reason the competent surgeon must be well acquainted with the different types of anæsthesia in order to enable him to select the best anæsthetic for a particular patient. Only in this way can an anæsthetic be administered without danger and as innocuous as possible for the organism. On the other hand the selected anæsthesia must not only render the operations completely painless but also enable the surgeon to perform it easily with the best surgical technique, and offer him all the conditions such as muscular relaxation, asepsis, etc., required for the performance and success of an operation.

Without criticising the advantages or disadvantages of different type of anæsthesia, I would say that in no circumstances where a low condition of the patient or particular sensibility of the organism makes the use of a particular type of anæsthesia dangerous, is the surgeon entitled to use it because he has for some reason or other preference for this type. Our operative statistics are full of the unsuccessful results of operations due only to the misuse of an anæsthetic. In many clinics abroad and in this country I have observed cases of simple operations, such as tonsilectomy, appendicitis or hernia, where the result has been fatal solely on account of the obstinacy and conservatism of the surgeon in giving preference to one type of anæsthesia.

Unfortunately by taking into consideration all these factors we must still recognize that at the present time we do

not possess an ideal method of anæsthesia, sufficiently competent to meet all the requirements necessary for the easy performance and success of an operation

Such an ideal anæsthesia in the opinion of Professor Sebrechts must be able to suppress the anguish of the patient and entirely abolish sensation, affording the surgeon perfect muscular relaxation, a maximal retraction of the internal organs, and a bloodless operative field. Furthermore it must not intoxicate the patient, injure his vital functions, or cause post-operative complications

In a previous work of mine, published in the *Lancet*, I brought to knowledge a new method of local anæsthesia which, in my opinion, not only dispenses with the disadvantages of the general or spinal types, but also allows the same possibilities of performing operations

Although this type of local anæsthesia offers me a more or less ideal condition for the success of an intervention, I should like to admit that there are patients, particularly women and children, who are afraid to submit themselves to an operation under local anæsthesia. For this reason I have been experimenting with a new type of anæsthesia by combining the intravenous evipan-sodium anæsthetic with novocaine infiltration or blocking of the operative field. This combination has given surprising results, particularly when adopted for major operations

### *Evipan-Sodium as an Anæsthetic*

A few years ago systematical experiments were begun with different derivatives of barbituric acid in trying to apply them as narcotics. In this way Croft and Taub were able to isolate N-methyl C C cyclo hexemyl methyl barbituric acid, which they called evipan. It was found that this drug was capable of inducing an easy and deep sleep, bringing the subjects into complete anæsthesia. Fairly large amounts of drug could be injected without any danger, and therefore the evipan gave hopes of being able to offer an ideal condition for general anæsthesia. The only difficulty stood in the fact of having the evipan in reliable solutions, but even this way was overcome by obtaining a sodium salt of this drug. The evipan-sodium solution is very unstable,

and therefore it must always be fresh, being prepared just before the injection

Surmounting the difficulties of the preparation of the drug, Wesse started a systematic study of the effects of evipan-sodium on animals and the condition of anæsthesia which it produced on them. It was found that as soon as the solution was injected the animal became quiet, lowered its head, and the respiration became slower but maintained its rhythm. No particular phenomena was observed during the sleep of the animal, with the exception that during the awakening a light tremor and small fibrillary twitching were present. It was established that the action of the drug was increased by injecting the solution rapidly. The intoxication of the animal began by injecting 25 m gr per kilo of body-weight which often ended in complete narcosis. This amount varied slightly in different animals, for instance in dogs, to 30 m gr. The maximum dose established was 100-110 m gr of evipan-sodium per K gr of body-weight. By exceeding this maximum dose death occurred in the animal from respiratory failure. These experiments on animals with so surprisingly encouraging results justified the application of the drug as a general anæsthetic on man. Monod found that evipan-sodium has a rapid action but also an equally rapid rate of recovery. This investigator observed that after 15 minutes the corneal reflex reappears, the patient reacts to pricks, replies to questions after 20-30 minutes, and in one hour's time the recovery is complete.

The metabolism of the evipan-sodium is effected by a chemical process of disintegration which takes place in the liver. The complete detoxication is very rapid, for instance, a rabbit disposes of its maximum dose in about 20 minutes. Owing to these properties the evipan-sodium is very much like the ethyl chloride, particularly in the rate of recovery. It was found that evipan-sodium injection produced no ill-effects even when injected in cases of emergency, and therefore the patient does not require any particular preparation, although Kaspar advises the use of evipan-sodium on an empty stomach. Furthermore, no damage on various organs has been found. The composition of the blood is unchanged and the liver is unaffected, although the metabolism of the evipan takes place in the former, and traces

of the drug have very rarely been found in the urine. The fall of the temperature is very slight, on the other hand the blood-pressure is lowered to a noticeable degree. Lauber gives 20-30 m gr of Hg as a normal fall of the blood-pressure which does not arouse any anxiety. The pulse-rate remains normal, being occasionally only slightly increased, the respiratory movements, although regular, are slightly lessened in their depth and frequency. The muscular tone is affected differently according to individuals, sometimes contraction of the skeletal muscles is found while those of the abdominal wall are relaxed. The corneal reflexes are already abolished by the small doses and the pupils are moderately dilated. However this is not always the case, as some observers have found them contracted or even not affected at all.

## ASSOCIATION OF ANÆSTHETISTS OF GREAT BRITAIN AND IRELAND

THE Annual General meeting was held on Thursday, the 31st October, at the Medical Society, Chandos St, W 1, at 8 30 p m Dr H W Featherstone (President) in the chair About fifty members were present

The minutes of the last General Meeting, which had been circulated, were taken as read and signed

The President referred to the sad loss which had been occasioned to the Association by the tragic death of Dr Howard Jones An appeal fund had been raised by the Association to help Mrs Howard Jones and children, to which members had responded generously, seventy having already contributed More than £250 had been raised to date, including a donation of £10 10s from the Association's funds *The British Journal of Anaesthesia* had made a generous donation The fund was to be closed in about a month's time Nearly £200 had already been sent to Mrs Howard Jones, who had written in terms of deepest gratitude to the Association The President said that he had written a letter of sympathy to her on behalf of the Council

Dr Hadfield proposed a vote of thanks to Dr Featherstone, Dr Blomfield and Dr Ramsey Phillips for the active steps they had taken in connection with this appeal This was seconded by Dr Hughes and carried unanimously

Dr Featherstone thanked the Association for its confirmation of their action

The President proposed a resolution that the second sentence of Rule 7 ("Return railway fares shall be paid to provincial members of the Council for attendance at one Council meeting each year") should be rescinded and the following inserted in its place "Third class railway fares shall be paid to provincial members of Council for each attendance at Council meetings" and that this new rule should apply for the past year (1934-1935) He pointed out that in order to make the Association representative of the country it was necessary to encourage provincial members

to attend Council meetings It would involve an expense of about £40 to £50 a year

Sir Francis Shipway proposed an amendment that the rule should read "Third class return railway fares "

The President moved the resolution with this amendment which was seconded by Sir F Shipway and carried unanimously

The President presented the Council's report for the year, of which the following is a summary —

"The Association is in a flourishing condition as regards funds, while the membership roll will soon reach the limit of 150 which is prescribed by the Rules

The tragic death of the late Howard Jones, who was Honorary Secretary of the Association from the time of its inception, has caused an irreparable loss, and it has served to strengthen our view that much remains to be done in order that the practice of anaesthetics shall be placed upon a sound financial basis

There have been seven meetings of the Council, and the several sub-committees have met as required Members of the Council have shown great interest in the work which they have been called upon to deal with, and there has been complete unanimity in the decisions which they have taken

Co-operation has been established with the Australasian Society of Anaesthetists and also with the newly formed Italian Society of Anaesthetists Dr Mennell has visited Australia in connection with the B M A meeting, where he delivered the second Embley Memorial Lecture Dr Mennell conveyed our greetings to the Australasian Society of Anaesthetists

In answer to the request of the British College of Obstetricians and Gynaecologists, Dr Mennell has served as the representative of anaesthetists on the Committee upon Analgesia in Midwifery Help or advice has been given in various matters of local hospital policy which have been submitted to the Council

Largely through the influence of Dr Claude Morris, University College Hospital has decided to appoint an anaesthetist to the Surgical Unit, whose salary is to be paid from

the Unit's funds. An effort is being made to increase the amount of the salary for this officer.

At the last Annual Meeting the Council was given power to negotiate with the Royal College of Surgeons of England with a view to establishing a Diploma in Anaesthetics. Four of your representatives (Dr Blomfield, Dr Hadfield, Dr Magill and I) met the President and representatives of the Council of the Royal College of Surgeons. Much interest was shown. It was suggested that the Conjoint Board should undertake the Diploma, to bring it into line with the other Diplomas in Public Health, Ophthalmology, etc. A detailed scheme was asked for and your representatives then discussed the matter with Mr Rew, the Secretary of the Examining Board in England. Armed with the schedules of other Diplomas, your Diploma Sub-Committee drew up a draft schedule for the Diploma which was discussed in detail by the whole Council. After minor alterations this was sent to the President of the Royal College of Surgeons and he submitted it to a committee of the Royal College of Physicians. Upon this committee Dr Morris was appointed to serve by the Council of the Royal College of Physicians. Finally the Committee of Management of the Examining Board in England received your representatives and approved the schedule. There was general agreement upon nearly all the points which were discussed, but the principle of election to the Diploma without examination was not accepted by the Royal Colleges until strong representations were laid before them. We pointed out, *inter alia*, that there was precedent in the case of the Fellowship diploma of the Royal College of Surgeons, and that while we did not seek for an examination which should be difficult or highly competitive, we sought for a hall-mark which should signify that an anaesthetist possessed satisfactory skill and knowledge. If the Diploma was to become a force in anaesthetics within the next few years, it was essential that the acknowledged anaesthetists of the country should possess it. The authorities insisted that the terms of this process of election should be explicit, and, as you are aware, for three years from the date of inauguration of the Diploma, an anaesthetist of ten years' standing at the main teaching hospital of a medical school is eligible for election to

the Diploma without examination We regard the principle to be of the utmost importance in establishing the Diploma, and it is our unhesitating belief that the award of the Diploma to leading anæsthetists will strengthen the speciality of Anæsthesia

The subject of Coroners' Inquests upon patients who have died under anæsthetics has progressed satisfactorily Personal interviews by Dr Mennell and Dr Magill with the authorities at the Home Office, including the Home Secretary (who was most helpful) led to an official request which I submitted to the Home Secretary that we should be allowed to submit evidence before the Departmental Committee on Coroners which had just been set up Lord Wright, the Chairman of the Committee, invited a written statement The statement was prepared with great care and printed copies were circulated among the members of the Committee At the interview at the Home Office, in the early summer, Dr Mennell, Dr Magill and I were well received, and the whole matter was examined with complete frankness It was agreed that we had established our case and we were asked to prepare a list of suggestions for alterations in the conduct of these inquests This has been done, and at the end of August copies of these suggestions were laid before Lord Wright and members of the Committee We are now awaiting further developments

“ This has been a year in which great progress has been made in establishing Anæsthesia as a regular department of Medicine, and your Council submit this report in the belief that you will be satisfied and in the hope that yet further progress will be made in the ensuing twelve months ”

It was proposed by Dr Ashworth and seconded by Sir F Shipway that in future a copy of the Council's report should be circulated to members before the Annual General Meeting This was carried unanimously

In the absence of the Treasurer the President read the financial report for the year ending June 30th, 1935 The report, which showed a balance of £341 11s 5d, was adopted unanimously

The question as to the use of the Association's funds was raised by Sir Francis Shipway and the matter was discussed



with the possibility of investments being made. It was finally decided that no definite decision should be taken until after the Treasurer's return from Australia.

Dr Magill and Dr. Sykes acted as scrutineers over the ballot.

*The following officers were elected —*

President	Dr Blomfield
Vice-President	Dr Hadfield
Hon Secretary	Dr Featherstone
Hon Treasurer	Dr Mennell

*The new members of the Council elected were —*

Sir F Shipway	Dr Langton Hewer
Dr F J Clausen	Dr Harold Sington

*The retiring members of the Council being —*

Messrs Apperly, Ashley Daly, and Ramsey Phillips

*The following candidates were elected members of the Association —*

Dr H E K Eccles (Royal Sussex Hospital, Brighton)
Dr N A Gillespie (London Hospital)
Dr F C Gibbs (Royal Infirmary, Edinburgh)
Dr A P Gorham (Bristol General Hospital)
Dr J B Holroyd (Sheffield Royal Infirmary)
Dr E Landau (St George's Hospital)
Dr H C Roberts (Liverpool Dental Hospital)
Dr L B Wevill (Royal Infirmary, Edinburgh)
Dr Rose E Williams (Manchester)

After the election of officers and candidates Dr Blomfield took the chair and thanked the Association for electing him President.

With regard to the payment of anæsthetists Dr George Edwards proposed that any anæsthetist receiving an honorarium at the present time should give it up and that the Council should take no immediate steps to procure payment for anæsthetists, as the whole question of the payment of the Honorary Staffs was coming up in the near future and it would be advisable for anæsthetists to place themselves on

a basis with the rest of the Honorary Staff and for the cases to be dealt with together

This was seconded by Dr McConnell and discussed, the following members speaking Messrs Greaves, R Phillips, Hedley, Boyle, Vaile and Daly

Mr Boyle moved the amendment that the matter should be left entirely to the sub-committee appointed to deal with the question and that they should report to the Council and the Association This was seconded by Dr Vaile, and Dr Edwards withdrew his resolution The amendment was carried Members were asked to write their suggestions and views to the sub-committee

Dr Sykes brought up the question of an anæsthetic museum This was briefly discussed Dr Blomfield informed Dr Sykes that the Royal College of Surgeons had a collection of anæsthetic apparatus, chiefly left by the late Dr Dudley Buxton, and members wishing to do so could add to this collection

After a vote of thanks to Dr Featherstone for his services as President of the Association, and one to the members of the Council for the work they had done during the past year, the meeting was adjourned

## ROYAL SOCIETY OF MEDICINE

## SECTION OF ANÆSTHETICS

AT the opening of the session on November 1st, Mr H A Richards, the new President, gave an address. After a brief history of inhalation anæsthesia, he continued

“In 1859 Niemann discovered the alkaloid of Coca leaves to which the name of cocaine was given, the first step in the history of spinal analgesia. The discovery by Schraff of the local analgesic properties of this substance when placed upon the tongue and the application of the latter discovery to surgical purposes suggested by Koller in 1884 made the second step fairly initiating the history of spinal analgesia. Corning’s experiments on prolongation of effect of cocaine given under the skin followed, the logical antecedent to his experiments with local medication of the cord. Next Quincke found it was possible to remove a considerable amount of cerebrospinal fluid without danger to the subject. Despite the fact that Corning had in his original contribution suggested the surgical application of the method no such trial was made until Bier of Kiel demonstrated its feasibility and published the result of his work. Soon afterwards Barker in this country adopted spinal analgesia, using stovaine instead of cocaine, which had proved too dangerous. Felix Rood a little later proved that it was safer to have the patient in the Trendelenburg position instead of sitting up as had been previously taught. Recently the fine work of the late Howard Jones with percaine has done much to extend the field of spinal analgesia.

Let me show very shortly how much better off is the anæsthetist of the present day than his predecessor at the beginning of the century.

The latter had at his disposal chloroform, ether and nitrous oxide with almost no mechanical aid, and a primitive mask or the corner of a towel to make one. True, Clover’s inhaler was in use, but the absence of hypodermic atropine made it difficult and unsafe to use, because of the salivation

and consequent chest complications Personally I consider the use of atropine as the drier up of secretions one of the greatest advances since the original discovery of anæsthetic drugs When I think of the first cases of open ether which I saw as a student I am filled with amazement that all the patients did not die of pneumonia, and that everybody in the theatre was not half-anæsthetised by the ether fumes An inefficiently padded mask was used and ether literally poured on from a very large bottle, with a Winchester of ether in reserve to replenish the original bottle Ether vapour everywhere, and a large fire in the corner of the theatre, but curiously enough never an explosion, or even the thought of one No wonder that chloroform was looked upon by some as a safer anæsthetic Atropine has changed the whole outlook, and ether came into its own as the basis of modern inhalation anæsthesia Now see what the modern anæsthetist has in his armamentarium

*Pre-operative* Hypodermics, atropine, morphia, omnopon, scopolamine

*Intravenous* Evipan, nembutal, pernocton

*Rectal* Avertin, paraldehyde, ether oil

*Oral* Nembutal, bromides, chloral, chloretone

*At operation* Chloroform, ether, nitrous oxide, cyclopropane, vinyl ether, high and low spinal injection, with percaïne, novocaine, heavy or light stovaine, and planocaine, and Pitken's tiltometer if he likes Intubation of the larynx by nose or mouth and all the different gas-and-oxygen machines to which the tube may be attached Boyle's, Walton's and McKesson's machines

This is a formidable list, and suitably used should make for greater safety and post-operative comfort The question always arises in my mind, does one do one's best purely from the patient's point of view? Having developed a liking for a particular method or drug are we not inclined to allow our liking to outrun our judgment? Do we not sometimes inflict on a patient post-operative discomfort which might have been avoided by some other method? Cannot we bring ourselves to look at the whole situation more from the patient's point of view? I speak with feeling

because many times I have been at the mercy of anæsthetists I admit that pre-anæsthetic drugs are now almost universally used and with enormous advantage to the patient It is after this that I am in doubt For example, why use spinal analgesia for an appendix or hernia when a simple anæsthetic answers perfectly well? The patient may vomit, or get a chest complication, as he may indeed after spinal, but he does not run the risk of a headache for three weeks, or nerve palsy, or paresis of sphincters, all of which I have seen more than once Endotracheal anæsthesia has great advantages in rendering possible operations requiring positive pressure, and certain positions of the patient, and in keeping the anæsthetist off the sterile field, but I see certain risks in the nasal method of applying it These are, troublesome epistaxis, and the conveyance of sepsis from nose to trachea A patient underwent partial gastrectomy, and the nasal method was employed, ten days later he died of lung abscess I wonder if that would have happened without the nasal intubation? I believe many sore throats are due to this procedure

Again I sometimes doubt if we use all the drugs at our disposal to their best advantage Take evipan for example This was provided for use in minor operations and I cannot believe that it was intended as an anæsthetic for major surgery My experience shows it to be uncertain in action and surely not to be relied on for surgical anæsthesia with proper relaxation Some method may, of course, be devised whereby evipan may be given continuously with better and more certain results Then I shall certainly try it for long operations

Anæsthetics in midwifery have lately attracted much attention The National Birthday League is financing research at several institutions to see whether every woman in labour may not be relieved of at least some of her pain There are many reasons why this ideal is at present unattainable

(1) Most of the midwifery of this country is carried out by midwives, who are not allowed to use anything stronger than chloral hydrate and potassium bromide

(2) Numbers of confinements take place in the patient's home, where continuous supervision by a doctor is impossible

The ideal could be achieved only if every woman went into an institution before labour started, if labour took place at a certain hour and was completed in a definite time. Instead of which labour begins at any time, often in unsuitable surroundings and without trained assistance. Most anæsthetics prolong labour with detriment to mother and child. Let us look at our sedatives and anæsthetics for labour.

Chloral hydrate, potassium bromide, opium in the form of morphia or omnopon, and nembital. As pre-anæsthetics we have avertin and paraldehyde, neither satisfactory owing to the chance of extrusion during a pain. As anæsthetics we may use chloroform, ether, gas and air, or gas and oxygen. Chloroform is cheap, portable and non-explosive, an important point while so many labours take place in small rooms with open fires. The frequency and strength of uterine contraction are, however, diminished, and worse still is the effect of chloroform on the cells of the liver. The danger is great if the patient has more than one administration at short intervals, for instance for examination, induction of labour, and later for version and for delivery. At King's College Hospital chloroform is never used in the labour ward. This is the kind of thing we fear. A healthy primigravida became noisy and uncontrollable in labour, and was given chloroform for a short time till spontaneous delivery. About two hours later it was reported that she was bleeding steadily, although the uterus was retracted. The bleeding was found to come from a tear in the cervix. For repair of this she was again given chloroform. In twenty-four hours she became jaundiced and died in sixty hours after delivery from hepatic toxæmia. The chloroform capsules containing 20 minims undoubtedly assist the doctor working single-handed. If more than about twelve are used, however, the risk of toxæmia may arise.

Ether may be used by inhalation or rectally. It, too, certainly diminishes the strength and frequency of the pains. Caution is needed because of its inflammability. Gas and oxygen is, if available, the anæsthetic of choice for labour. As a rule it does not inhibit either the strength or the frequency of pains. The best results are obtained when the patient has had either nembital by the mouth or morphia

and scopolamine beforehand. It is interesting to observe how after about an hour of the intermittent administration the patient sleeps between the pains, as though the effect of the gas were cumulative. Minnitt's apparatus is a great advance towards analgesia for every labour. The accoucheur can work single-handed if the patient is intelligent and co-operates. Considerable relief can be given without interfering with the progress of the labour. The handicap to the machine is its weight with the 20-gallon cylinders attached. If the new light cylinders are used the apparatus becomes unstable. If the rules were altered and midwives permitted to use gas-and-air, the apparatus would necessitate the use of a car and a strong man to carry it upstairs. Universal anæsthesia for labour would in my opinion entail a certain amount of delay in the pains which will sometimes be followed by hurried delivery with forceps and ultimate distress for the mother.

*Teaching of students* This is a matter of grave concern to all anæsthetists on the staff of teaching hospitals. I have the anæsthetic clerk for one month, during which time he is expected to learn how to give anæsthetics—an impossible situation. The bulk of students become general practitioners and are supposed as such to be able to give an anæsthetic with fair success. At a loss what to teach them in the way of giving anæsthetics, I rather teach them what not to do. For example, my clerk may look into a patient's eye, but he may not touch the cornea, and he is not allowed to have a cyanosed patient. I do teach him to observe the patient's breathing, and having got the patient past the excitement stage to apply to the breathing his physiological knowledge of what happens to the respiratory centre when it is stimulated or depressed. One's difficulties are increased by divided loyalties between patient, surgeon and other occupants of the theatre. For the patient it is no doubt always best that he should have a preliminary drug. Will my clerk be able to continue this in practice, or must he be shown anæsthesia without preliminaries? Again, if for my clerk's benefit I leave the patient to him the surgeon is likely to suffer from insufficient narcosis. I try to steer a course which will instruct the student, not too greatly impede the surgeon, and not have too uncomfortable an amount of

ether about the theatre. I do not attempt to teach gas-and-oxygen with complicated apparatus. For routine work I teach the student to use Clover's inhaler, starting with gas into the rebreathing bag. For continuance he is taught semi-ether from a well-padded mask, which has a tube led through it permitting oxygen or CO<sub>2</sub> at will. Chloroform is shown only if the occasion arises when it is to the patient's benefit. The student is shown the art of oral intubation of the larynx, and if he meets an edentulous patient towards the end of his month generally succeeds in passing the tube. He is shown how to do lumbar puncture, but is not allowed to do it.

*Deaths under or associated with anæsthetics.* The Registrar-General's figures fill one with dismay. In 1921, for example, 204 men and 133 females are grouped under this head, a total of 347. Now look at the figures for 1931 to 1933. In 1931 these are: Men 413, women 310, total 723. In 1932, 416 and 333, total 749, and in 1933, men 425, women 343, total 768. These figures appear to show that since 1921 the death-rate associated with anæsthetics has been more than doubled. Naturally the figures are of little value without those of operations done. Let us hope that the number of operations in England and Wales during the later years were more than double those of 1921."

The discussion which followed was chiefly devoted to the teaching of anæsthetics. Mr Ashley Daly maintained that as the general practitioner inevitably has to employ chloroform, the student should be instructed in its use. Mr H. P. Crampton contended that chloroform is safe only in expert hands, and Dr H. P. Fairlie was so convinced of its inevitable danger that students should be taught to avoid it. Dr Cecil Hughes believed in the teaching of open ether, but that the student should also be taught to induce anæsthesia with a mixture of ether and chloroform. Mr Jarman said that he had now an improved method for continuous evipan anæsthesia.

Mr I. W. Magill said he had abandoned the routine use of atropine except for children. He preferred a suitable dose of omnopon and scopolamine, which was free from the disturbing tachycardia and palpitation sometimes observed



when atropine was given alone. He had not found any disadvantageous secretion of mucus when using the combination mentioned.

With regard to risks associated with nasal intubation he had used the method consistently for many years. He could say without exaggeration that his experience now covered some thousands of cases.

From his observations and experience he was absolutely convinced that the incidence of epistaxis and other traumatic conditions associated with nasal intubation was in direct proportion to the precautions taken and to the dexterity of the anæsthetist.

## ABSTRACTS

*"Bodily measurement and anæsthesia"* *Lancet*, October 26, 1935, p 972.

It has never occurred to the anæsthetist that he might find an indication of his patient's reaction to anæsthetics by measuring his legs and his trunk Piney, however, points out that in seventeen instances in which the leg-length, measured from the top of the great trochanter to the heel, was greater than the trunk-length, from the top of the great trochanter to the vertex, these peculiarities were also present

(1) The aorta was strikingly narrow

(2) The thymus gland was present and varied in weight from one-quarter to one and one-quarter ounces

(3) The spleen was rather large, and the Mælpighian bodies were strikingly prominent

(4) Mesenteric glands were unusually large and numerous

Two of the seventeen post-mortems were on the victims of sudden death during anæsthesia, the other fifteen were on suicides The seventeen were in a series of 500 post-mortem examinations Piney concludes that persons with leg-length more than 50 per cent of the total body-length are liable to sudden death under anæsthesia, as well as being potentially suicidal He adds "It seems to be possible that some anæsthetic deaths would be avoided if measurements were taken before anæsthesia were started"

*"Treatment of Hirschsprung's disease by spinal anæsthesia"* *New Orleans Med Surg Journ*, August, 1935, p 83

Congenital idiopathic megacolon, Hirschsprung's disease, is obstinate constipation without organic obstruction The colon often becomes enormous, and the child's abdomen tense and thin-skinned On the theory that the condition might be due to autonomic inco-ordination with sympathetic preponderance surgeons have carried out section of the lumbar sympathetic nerves with good results. Later,

spinal anæsthesia was tried for the same purpose and succeeded. The article gives in detail two more examples, in children of eight and nine years, in whom intra-spinal injection of novocain for Hirschsprung's disease gave most satisfactory results.

*"Seven years of spinal anæsthesia in private practice"*

*Canadian Med Assoc Journ*, Sept 1935, p 298

Although the author puts forward nothing new, except some minor technical devices, this article is worth reading for its level-headedness. The devices alluded to are (1) constant use of the Sise thumbstick and (2) "bull-dog" tie-pin fastener threaded backwards on the needle and pushed up to the shoulder before the puncture is made, in order to secure that the needle is not pulled out or pushed in at all when the injection is made. The author uses novocain, and for long anæsthesia nupercaine in 1 to 1000 solution. He found that combination of the two gave him both the best prolonged anæsthesia and the worst reaction. He records no fatality. He uses habitually premedication by barbiturates, as well as morphia and hyoscine half an hour before operation.

*"Kirschner's interrupted method of spinal anæsthesia"* L

STECHER in *Wiener Klin Woch*, No 41, 1935, p 128

The author discusses the *rationale* of different methods of producing analgesia by endotheal injection, and explains his preference for that of Kirschner. This is a somewhat complicated process for the carrying out of which a double syringe is employed. Air is injected into the spinal canal as well as the anæsthetic solution. The dose is not given all at once but in small quantities, which are augmented in accordance with the need shown by testing the height of analgesia reached. Percain is the chosen anæsthetic agent. Great exactness in localisation and absence of ill effects on blood-pressure are the chief advantages claimed.

*"Avertin in thyroid surgery"* K. M. HEARD, in *Canadian Med Assoc Journ*, October, 1935, p 395

The author has investigated the current literature dealing

with avertin during the years 1932-34, as shown by five journals in which he examined articles on the same subject during 1926-27 and 1910-31. He records a great increase in the employment of avertin, 13,600 administrations being dealt with in the latest period. Only four writers showed dissatisfaction and their experience was limited to 43 cases, as distinct from the 13,627 cases of the other observers whose general conclusions ranged from satisfaction to enthusiasm. Little mention was made in these records of avertin for thyroid work. The author has come to regard the drug as of pre-eminent value in this brand of surgery. His report deals with sixty cases, entirely unselected. Nitrous oxide was the anæsthetic employed and was generally started half an hour after injection with avertin. No other preliminary was used and high percentages of oxygen were given with the gas. The usual dose was 100 mgm per kilo of body weight.

*"Allergic shock from local and general anæsthetics"* *Anæst and Analg*, September-October, 1935, p 199

The author seeks to explain sudden unexpected deaths associated with anæsthesia on the basis of their analogy to death from anaphylaxis. He maintains that the post-mortem findings are the same in the two kinds of fatality, and that in the case of local anæsthetics which have resulted in death, there is local oedema at the site of injection, which is analogous to the allergic skin reactions seen on injecting a sensitive subject. His arguments, intended to prove that sudden death in connection with general anæsthesia is often allergic, appear unconvincing.

*"Treatment of cancer by anæsthetics"* *Anæst and Analg*, September-October, 1935, p 205

A novel therapeutic use for ether and chloroform is recommended by Dr R W Benner, who believes that these drugs taken by inhalation can play an important part in the treatment of cancer. Dr Benner arrives at this conclusion along two paths of reasoning. Firstly, he maintains that pathological cell-division, which is cancer, takes place only in the presence of alkalosis. The normal tissue cell is maintained in a medium or serum with a definite acid-base equilibrium, 7.38. In acidosis the hydrogen-ion

and to prevent any tooth, etc., from being drawn in during the extractions. The inconvenient after-effects of purely ethyl-chloride anaesthesia are avoided, while its advantage of rapid induction is gained.

Beckett<sup>2</sup>, in discussing the choice of dental anaesthetics, says, "The real question is to decide at what age a child is too young to take gas satisfactorily." By using the method just described gas can obviously be employed for every age at which extraction with an anaesthetic is required. Without that method it is probably correct, as Beckett states, that under about the age of ten years "it is generally useless to try and produce satisfactory anaesthesia with gas, or gas and oxygen." For adults, in the vast majority of instances, he selects gas and oxygen by the nasal route, but points out how many patients are best treated, not in the dental chair, but in a nursing home where prolonged anaesthesia can be safely and conveniently maintained. He disapproves of chloroform for any dental operation.

*"The relief of pain during labour"* L. C. CONN and J. R. VANT in *Canad Med Assoc Journ*, November, 1935

The authors describe the use of many drugs and their combinations, but the details of the report concern over 400 patients treated mostly with barbiturates assisted by morphia or hyoscine and finally nitrous oxide. In a separate series of over 190 nembutal was used in association with rectal paraldehyde and olive oil. A certain number of patients needed treatment for restlessness. For this purpose pernocton was used by the vein. For the most part three to six grains of nembutal was given first and repeated usually from half an hour to one hour afterwards every one to four hours. The repeated doses were half the size of the original dose. In a good many instances one or two of the later doses of nembutal were replaced by hyoscine (1/200th gr). In primiparae 84.2 per cent obtained satisfactory amnesia, but in multiparae only 53.1 per cent. When paraldehyde was used it was given in doses of 6 to 8 drachms to 1 ounce of olive oil. This followed one half to one hour after 6 grains of nembutal. The authors are pleased with the results of their method but point out it is not effective unless started early in labour and under medical control throughout.

